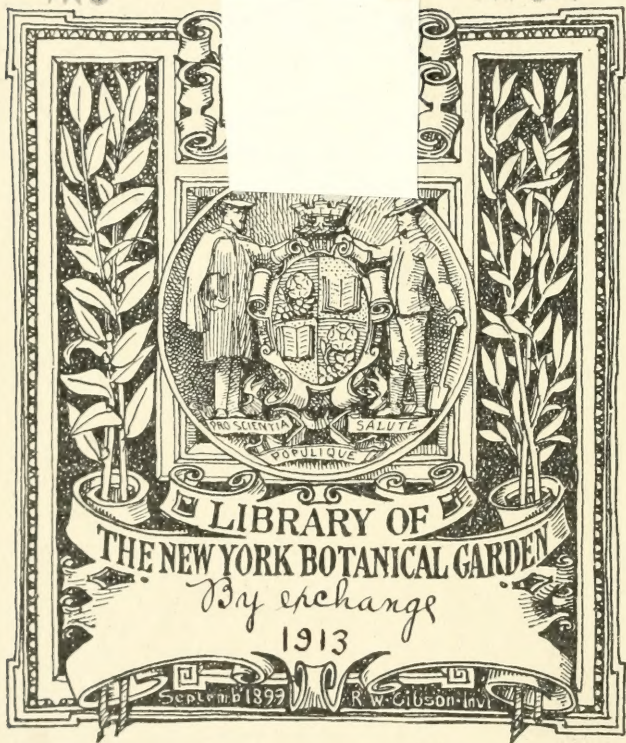




XE, X5

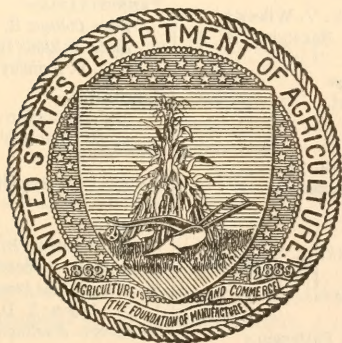
v. 29



U. S. DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS
A. C. TRUE, DIRECTOR

EXPERIMENT STATION RECORD

VOLUME XXIX, 1913



LIBRARY
NEW YORK
BOTANICAL
GARDEN.

WASHINGTON
GOVERNMENT PRINTING OFFICE
1914

U. S. DEPARTMENT OF AGRICULTURE.

Scientific Bureaus.

WEATHER BUREAU—C. F. Marvin, *Chief*.
 BUREAU OF ANIMAL INDUSTRY—A. D. Melvin, *Chief*.
 BUREAU OF PLANT INDUSTRY—W. A. Taylor, *Chief*.
 FOREST SERVICE—H. S. Graves, *Forester*.
 BUREAU OF SOILS—Milton Whitney, *Chief*.
 BUREAU OF CHEMISTRY—C. L. Alsberg, *Chief*.
 BUREAU OF STATISTICS—L. M. Estabrook, *Statistician*.
 BUREAU OF ENTOMOLOGY—L. O. Howard, *Entomologist*.
 BUREAU OF BIOLOGICAL SURVEY—H. W. Henshaw, *Chief*.
 OFFICE OF PUBLIC ROADS—L. W. Page, *Director*.

OFFICE OF EXPERIMENT STATIONS—A. C. True, *Director*.

THE AGRICULTURAL EXPERIMENT STATIONS.

ALABAMA—

College Station: *Auburn*; J. F. Duggar.^a
 Canebrake Station: *Uniontown*; L. H. Moore.^a
 Tuskegee Station: *Tuskegee Institute*; G. W. Carver.^a

ALASKA—Sitka: C. C. Georgeson.^b

ARIZONA—Tucson: R. H. Forbes.^a

ARKANSAS—Fayetteville: M. Nelson.^a

CALIFORNIA—Berkeley: T. F. Hunt.^a

COLORADO—Fort Collins: C. P. Gillette.^a

CONNECTICUT—

State Station: *New Haven*; } E. H. Jenkins.^a
 Storrs Station: *Storrs*; }

DELAWARE—Newark: H. Hayward.^a

FLORIDA—Gainesville: P. H. Rolfs.^a

GEORGIA—Experiment: R. J. H. De Loach.^a

GUAM—Island of Guam: J. B. Thompson.^b

HAWAII—

Federal Station: *Honolulu*; E. V. Wilcox.^b
 Sugar Planters' Station: *Honolulu*; H. P. Agee.^a

IDAHO—Moscow: W. L. Carlyle.^a

ILLINOIS—Urbana: E. Davenport.^a

INDIANA—La Fayette: A. Goss.^a

IOWA—Ames: C. F. Curtiss.^a

KANSAS—Manhattan: W. M. Jardine.^a

KENTUCKY—Lexington: J. H. Kastle.^a

LOUISIANA—

State Station: *Baton Rouge*; }
 Sugar Station: *Audubon Park*, } W. R. Dodson.^a
New Orleans; }
 North La. Station: *Calhoun*; }

MAINE—Orono: C. D. Woods.^a

MARYLAND—College Park: H. J. Patterson.^a

MASSACHUSETTS—Amherst: W. P. Brooks.^a

MICHIGAN—East Lansing: R. S. Shaw.^a

MINNESOTA—University Farm, St. Paul: A. F. Woods.^a

MISSISSIPPI—Agricultural College: E. R. Lloyd.^a

MISSOURI—

College Station: *Columbia*; F. B. Mumford.^a
 Fruit Station: *Mountain Grove*; Paul Evans.^a

^a Director.

^b Special agent in charge.

^c Acting director.

MONTANA—Bozeman: F. B. Linfield.^a

NEBRASKA—Lincoln: E. A. Burnett.^a

NEVADA—Reno: S. B. Doten.^a

NEW HAMPSHIRE—Durham: J. C. Kendall.^a

NEW JERSEY—New Brunswick: J. G. Lipman.^a

NEW MEXICO—State College: Fabian Garcia.^a

NEW YORK—

State Station: *Geneva*; W. H. Jordan.^a

Cornell Station: *Ithaca*; W. A. Stocking, jr.^c

NORTH CAROLINA—

College Station: *West Raleigh*; } B. W. Kilgore.^a
 State Station: *Raleigh*; }

NORTH DAKOTA—Agricultural College: T. P. Cooper.^a

OHIO—Wooster: C. E. Thorne.^a

OKLAHOMA—Stillwater: L. L. Lewis.^a

OREGON—Corvallis: A. B. Cordley.^a

PENNSYLVANIA—

State College: *R. L. Watts*.^a

State College: *Institute of Animal Nutrition*;
 H. P. Armsby.^a

PORTO RICO—

Federal Station: *Mayaguez*; D. W. May.^b

Sugar Planters' Station: *Rio Piedras*; J. T. Crawley.^a

RHODE ISLAND—Kingston: B. L. Hartwell.^a

SOUTH CAROLINA—Clemson College: J. N. Harper.^a

SOUTH DAKOTA—Brookings: J. W. Wilson.^a

TENNESSEE—Knoxville: H. A. Morgan.^a

TEXAS—College Station: B. Youngblood.^a

UTAH—Logan: E. D. Ball.^a

VERMONT—Burlington: J. L. Hills.^a

VIRGINIA—

Blacksburg; S. W. Fletcher.^a

Norfolk: Truck Station, T. C. Johnson.^a

WASHINGTON—Pullman: I. D. Cardiff.^a

WEST VIRGINIA—Morgantown: E. D. Sander son.^a

WISCONSIN—Madison: H. L. Russell.^a

WYOMING—Laramie: H. G. Knight.^a

EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, PH. D., *Assistant Director*.
Assistant Editor: H. L. KNIGHT.

EDITORIAL DEPARTMENTS.

- Agricultural Chemistry and Agrotechny—L. W. FETZER, Ph. D., M. D.
Meteorology, Soils, and Fertilizers { W. H. BEAL.
R. W. TRULLINGER.
Agricultural Botany, Bacteriology, Vegetable Pathology { W. H. EVANS, Ph. D.
W. E. BOYD.
Field Crops { J. I. SCHULTE.
G. M. TUCKER, Ph. D.
Horticulture and Forestry—E. J. GLASSON.
Foods and Human Nutrition { C. F. LANGWORTHY, Ph. D., D. Sc.
H. L. LANG.
Zootechny, Dairying, and Dairy Farming—H. WEBSTER.
Economic Zoology and Entomology—W. A. HOOKER, D. V. M.
Veterinary Medicine { W. A. HOOKER.
L. W. FETZER.
Rural Engineering—R. W. TRULLINGER.
Rural Economics—B. B. HARE.
Agricultural Education—C. H. LANE.
Indexes—M. D. MOORE.

CONTENTS OF VOLUME XXIX.

EDITORIAL NOTES.

	Page.
Fourth session of the General Assembly of the International Institute of Agriculture	1
The Tenth International Congress of Agriculture	101
The quarter centennial of Prof. Thorne's directorship	106
Fiftieth anniversary of the American Veterinary Medical Association	301
The administrative management of the modern station	401
The moral of 25 years	404
The essentials of research	406
Convention of Association of Agricultural Colleges and Experiment Stations	601
Closer relations between the Department of Agriculture and experiment stations	604
Research, experiment, and demonstration	701
The essentials of research	702
Lines of demarcation between experiment and demonstration	707

STATION PUBLICATIONS ABSTRACTED.

ALABAMA COLLEGE STATION:		Page.
Bulletin 168, December, 1912.....		370
169, January, 1913.....		335
170, February, 1913.....		336
171, February, 1913.....		585
172, February, 1913.....		552
173, September, 1913.....		831
ALASKA STATIONS:		
Annual Report, 1912.....	722, 726, 735, 742, 743, 770, 790, 791, 793	
ARIZONA STATION:		
Bulletin 70, February 1, 1913.....		725, 735
Twenty-third Annual Report, 1912.....	415, 426, 439, 440, 443, 453, 467, 484, 496	
ARKANSAS STATION:		
Bulletin 112, 1912.....		649
113, 1913.....		649
114, 1913.....		640
Circular 17, May, 1913.....		641
CALIFORNIA STATION:		
Bulletin 236, February, 1913.....		52
237, June, 1913.....		573
238, May, 1913.....		540
239, June, 1913.....		540
Circular 87.....		32
88.....		71
89.....		82
90.....		79
91.....		77
92.....		81
93, March, 1913.....		94
94.....		71
95.....		71
96.....		69
97.....		71
98.....		31
99, June, 1913.....		574
100, June, 1913.....		542
101, June, 1913.....		558
102, June, 1913.....		558
103, June, 1913.....		814
104, August, 1913.....		852
105, August, 1913.....		852
Annual Report, 1913.....	884, 888, 899	
COLORADO STATION:		
Bulletin 186, May, 1913.....		621
187, June, 1913.....		871
188, June, 1913.....		872
CONNECTICUT STATE STATION:		
Bulletin 176, May, 1913.....		536
177, August, 1913.....		655
178, September, 1913.....		753
Thirty-sixth Annual Report, 1912, pt. 5.....		547, 552
pt. 6.....		546, 599
Thirty-seventh Annual Report, 1913, pt. 1.....		660

CONNECTICUT STORRS STATION:		Page.
Bulletin 74, December, 1912.....		288
DELAWARE STATION:		
Bulletin 99, December 1, 1912.....		712
100, May 15, 1913.....		793
101, May 20, 1913.....		744
102, May 1, 1913.....		711
FLORIDA STATION:		
Bulletin 114, June, 1913.....		576
115, July, 1913.....		641
116, October, 1913.....		846
117, November, 1913.....		847
118, November, 1913.....		833
Annual Report, 1912.....	211, 224, 228, 237, 242, 247, 248, 251, 262, 272, 299	
GEORGIA STATION:		
Bulletin 101, December, 1912.....		557
102, December, 1912.....		573
Twenty-fifth Annual Report, 1912.....		599
HAWAII STATION:		
Press Bulletin 40, April 1, 1913.....		270
41, April 1, 1913.....		236
42, May 21, 1913.....		633
43, June 1, 1913.....		784
44, July 1, 1913.....		747
Annual Report, 1912....	203, 208, 210, 212, 224, 231, 233, 234, 235, 241, 252, 270, 299	
HAWAIIAN SUGAR PLANTERS' STATION:		
Division of Agriculture and Chemistry Bulletin 41, April, 1913.....		413
IDAHO STATION:		
Bulletin 75, August, 1912.....		236
76, March, 1913.....		540
77, September, 1913.....		870
ILLINOIS STATION:		
Bulletin 161, November, 1912.....		77
162, January, 1913.....		78
163, June, 1913.....		772
164, July, 1913.....		771
Circular 165 [second edition, revised], December, 1912.....		623
165 [third edition, revised], February, 1913.....		623
165 [fourth edition, revised], May, 1913.....		623
166, May, 1913.....		674
167, May, 1913.....		623
168, September, 1913.....		820
168 [second edition, revised], October, 1913.....		820
Soil Report 5, July, 1913.....		727
Twenty-fifth Annual Report, 1912.....		194
INDIANA STATION:		
Bulletin 164, March, 1913.....		439
165, April, 1913.....		434
166, May, 1913.....		626
IOWA STATION:		
Research Bulletin 9, November, 1912.....		723
10, March, 1913.....		712
11, June, 1913.....		824
12, June, 1913.....		802

	Page.
KANSAS STATION:	
Bulletin 183, October 1, 1912.....	873
184, July, 1913.....	879
185, July, 1913.....	836
186, December, 1912.....	873
187, January, 1913.....	823
Circular 28.....	575
29.....	653
30.....	666
KENTUCKY STATION:	
Bulletin 168, December 31, 1912.....	823
169, January 1, 1913.....	41
170, January, 1913.....	270
171, April 1, 1913.....	276
172, May 1, 1913.....	640
LOUISIANA STATIONS:	
Bulletin 140, May, 1913.....	338
141, July, 1913.....	638
MAINE STATION:	
Bulletin 207, December, 1912.....	251
208, December, 1912.....	121, 194
209, January, 1913.....	129
210, February, 1913.....	255
211, March, 1913.....	258
212, March, 1913.....	145
213, June, 1913.....	654
214, July, 1913.....	774
Official Inspection 46, January, 1913.....	144
47, February, 1913.....	146
Document 435.....	141
467, February, 1913.....	259
MARYLAND STATION:	
Bulletin 164, February, 1912.....	146
165, February, 1912.....	193
166, April, 1912.....	128
167, May, 1912.....	230
168, July, 1912.....	366
169, August, 1912.....	375
170, October, 1912.....	337
171, December, 1912.....	371
172, January, 1913.....	336
173, January, 1913.....	339
174, February, 1913.....	384
175, March, 1913.....	353
MASSACHUSETTS STATION:	
Bulletin 144, July, 1913.....	741
145, September, 1913.....	876
Meteorological Bulletins 291-292, March-April, 1913.....	121
293-294, May-June, 1913.....	415
295-296, July-August, 1913.....	722
297-298, September-October, 1913.....	812
Circular 35, March, 1913.....	820

MICHIGAN STATION:		Page.
Special Bulletin 59, March, 1913.....		148
60, March, 1913.....		145
61, March, 1913.....		146
Technical Bulletin 13, June, 1912.....		82
14, June, 1912.....		80
15, June, 1912.....		8
16, June, 1912.....		20
17, February, 1913.....		618
Circular 19, April, 1913.....		145
20, April, 1913.....		148
MINNESOTA STATION:		
Bulletin 130, May, 1913.....		575
131, April, 1913.....		262
132, April, 1913.....		875
MISSISSIPPI STATION:		
Bulletin 161, February, 1913.....		35
Technical Bulletin 3, January, 1913.....		320
4, 1913.....		416
Circular on Diseases Prevalent Among Horses and Cattle, July, 1913.....		676
Work on Alfalfa at Holly Springs, September 1, 1912.....		736
MISSOURI STATION:		
Bulletin 108, February, 1913.....		427
109, February, 1913.....		420
110, February, 1913.....		670
111, February, 1913.....		696
112, May, 1913.....		667
113, August, 1913.....		745
Research Bulletin 6, February, 1913.....		490
Circular 58, January, 1913.....		626
59 [revised], March, 1913.....		899
60, March, 1913.....		899
61, April, 1913.....		872
62, May, 1913.....		854
63, March, 1913.....		838
64, July, 1913.....		879
65, July, 1913.....		870
MISSOURI FRUIT STATION:		
Biennial Report, 1911-12.....		599
MONTANA STATION:		
Bulletin 92, November, 1912.....		652
93, July, 1913.....	630,	696
Circular 20, December, 1912.....		651
21, February, 1913.....		688
22, March, 1913.....		634
23, February, 1913.....		674
24, February, 1913.....		683
25, February, 1913.....		639
26, February, 1913.....		639
27, April, 1913.....		692
Nineteenth Annual Report, 1912.....		616, 696

NEBRASKA STATION:

	Page.
Bulletin 133, October 21, 1912.....	71
134, March 25, 1913.....	48
135, April 1, 1913.....	225
136, April 10, 1913.....	332
137, May 26, 1913.....	546
138, June, 1913.....	593
Research Bulletin 1, March 1, 1913.....	47
2, April 1, 1913.....	333
3, June 25, 1913.....	724
Twenty-sixth Annual Report, 1912.....	736, 771, 793

NEVADA STATION:

Report Department Food and Drugs Control, 1912.....	266
Department Weights and Measures, 1912.....	266
Annual Report, 1911.....	111, 138, 147, 158, 194
1912.....	138, 147, 158, 194

NEW HAMPSHIRE STATION:

Bulletin 163 (Twenty-third and Twenty-fourth Reports, 1911-12), November 1, 1912.....	722, 736, 748, 771, 793
164, February, 1913.....	741
165, March, 1913.....	769

NEW JERSEY STATIONS:

Bulletin 256, May 7, 1913.....	665
Circular 17.....	559
18.....	549
19.....	536
20.....	535
21.....	536
22.....	574
23.....	574
24.....	543
25.....	599
26.....	653

NEW MEXICO STATION:

Bulletin 86, April, 1913.....	620
87, June, 1913.....	842

NEW YORK CORNELL STATION:

Bulletin 324, December, 1912.....	560
325, December, 1912.....	55
326, January, 1913.....	22
327, February, 1913.....	273
328, March, 1913.....	346
329, April, 1913.....	348
330, April, 1913.....	538
331, April, 1913.....	555
332, May, 1913.....	541
333, May, 1913.....	556
Circular 15, March, 1913.....	228
16, March, 1913.....	293
17, April, 1913.....	578
18, May, 1913.....	578
19, May, 1913.....	549
20, May, 1913.....	551
Memoir 1, July, 1913.....	818

NEW YORK STATE STATION:

	Page.
Bulletin 360, February, 1913.....	22
361, March, 1913.....	41, 42
362, February, 1913.....	40
363, April, 1913.....	473, 474
364, July, 1913.....	838
365, August, 1913.....	878
Technical Bulletin 26, December, 1912.....	9
27, March, 1913.....	279
28, March, 1913.....	253
29, March, 1913.....	222
30, July, 1913.....	762
31, September, 1913.....	805
Circular 20, January 22, 1913.....	355
21, February 10, 1913.....	354
22.....	339
23, March 4, 1913.....	356
24, March 20, 1913.....	339
Thirty-first Annual Report, 1912.....	812, 899

NORTH CAROLINA STATION:

Thirty-fifth Annual Report, 1912.....	21, 31, 35, 49, 50, 52, 56, 69, 76, 77, 95
---------------------------------------	--

NORTH DAKOTA STATION:

Bulletin 103, March, 1913.....	634
104, April, 1913.....	690
105, August, 1913.....	788
Special Bulletin, vol. 2, No. 12, January, 1913.....	661
13, February, 1913.....	661
14, April, 1913.....	661
15, May, 1913.....	659, 661
16, June, 1913.....	661
17, July, 1913.....	803, 865
18, August, 1913.....	803, 865
19, September, 1913.....	803, 811, 865
Third Annual Report Williston Substation, 1910.....	209, 211, 225, 299
Fourth Annual Report Williston Substation, 1911.....	209, 211, 226, 237, 299
Fifth Annual Report Williston Substation, 1912.....	415, 424, 496

OHIO STATION:

Bulletin 247, June, 1912.....	32
248, June, 1912.....	87
249 (Thirty-first Annual Report, 1912), July, 1912.....	722, 793
250, August, 1912.....	51
251, September, 1912.....	257
252, December, 1912.....	41
253, December, 1912.....	653
254, December, 1912.....	746
255, January, 1913.....	807, 861
256, February, 1913.....	31, 42, 82
257, February, 1913.....	36
258, February, 1913.....	137
Circular 131, February 25, 1913.....	213
132, April 2, 1913.....	432
133, April 15, 1913.....	436
134, April 25, 1913.....	674
135, May 1, 1913.....	775

OHIO STATION—Continued.	Page.
Circular 136, May 15, 1913.....	775
137, June 9, 1913.....	757
138, June 21, 1913.....	728
139, June 15, 1913.....	899
OKLAHOMA STATION:	
Bulletin 98, August, 1912.....	355
99, June, 1913.....	876
100, October, 1912.....	853
Circular 16, December, 1912.....	830
OREGON STATION:	
Bulletin 114, January, 1913.....	534
Research Bulletin 1, pt. 1, April 22, 1913.....	541
Biennial Crop Pest and Horticultural Report 1911-12.....	145,
	147, 148, 150, 153, 154, 158
PENNSYLVANIA STATION:	
Bulletin 121, April, 1913.....	437
122, July, 1913.....	773
123, August, 1913.....	885
PORTO RICO STATION:	
Bulletin 11 (Spanish edition), June 24, 1913.....	623
13, October 20, 1913.....	815
Annual Report, 1912.....	609, 622, 623, 631, 637, 641, 650, 652, 666, 696
PORTO RICO SUGAR PRODUCERS' STATION:	
Bulletin 1, 1911.....	95
4, April, 1913.....	513
Circular 2, May, 1913.....	645
Second Annual Report, 1912.....	12, 17, 37, 45, 52, 95
Irrigation [Pamphlet], 1912.....	85
RHODE ISLAND STATION:	
Bulletin 153, March, 1913.....	419
154, April, 1913.....	417
Inspection Bulletin, May, 1913.....	570
June, 1913.....	626
September, 1913.....	823
SOUTH CAROLINA STATION:	
Bulletin 172, September, 1913.....	731
SOUTH DAKOTA STATION:	
Bulletin 139, August, 1912.....	19
140, January, 1913.....	37
141, January, 1913.....	331
142, January, 1913.....	635
143, April, 1913.....	669
144, June, 1913.....	774
145, June, 1913.....	728
TENNESSEE STATION:	
Bulletin 97, January, 1913.....	25
98, April, 1913.....	53
99, April, 1913.....	236
Twenty-fourth Annual Report, 1911.....	616, 658, 666, 696
Twenty-fifth Annual Report, 1912.....	616, 653, 658, 667, 696

TEXAS STATION:

	Page.
Bulletin 155, January, 1913.....	801
156, March, 1913.....	804
157, April, 1913.....	889
158, June, 1913.....	859
Twenty-fifth Annual Report, 1912.....	696

UTAH STATION:

Bulletin 121, January, 1913.....	18
122, January, 1913.....	18
Circular 8.....	147
9, March, 1913.....	148
10, March, 1913.....	259
11.....	543
12, July, 1913.....	541

VERMONT STATION:

Bulletin 167, June, 1912.....	113, 115
168, August, 1912.....	550
169, October, 1912.....	743
170, December, 1912.....	740, 741, 769, 775, 777
171, April, 1913.....	736, 769
172, May, 1913.....	739
173, June, 1913.....	731, 785
Twenty-fifth Annual Report, 1912.....	157, 194

VIRGINIA STATION:

Bulletin 202, May, 1913.....	533
Annual Reports, 1911-12.....	610,
	611, 616, 621, 623, 629, 630, 638, 645, 647, 648, 696

WASHINGTON STATION:

Bulletin 111, September, 1913.....	833
Popular Bulletin 50, January 30, 1913.....	32
51, February 20, 1913.....	42
52.....	42
53, May 19, 1913.....	879
54, August 12, 1913.....	875
55, August 24, 1913.....	878
56, September 11, 1913.....	848
57, September 13, 1913.....	870

WEST VIRGINIA STATION:

Bulletin 140, April, 1913.....	744
141, April, 1913.....	745
Inspection Bulletin 1, June, 1913.....	731

WISCONSIN STATION:

Bulletin 229, April, 1913.....	589
230, May, 1913.....	623
231, April, 1913.....	675
Research Bulletin 29, May, 1913.....	624
Circular of Information 42, April, 1913.....	367
43, March, 1913.....	367
44, April, 1913.....	420

WYOMING STATION:

Bulletin 97, April, 1913.....	77
98, April, 1913.....	370
99, July, 1913.....	756
100, September, 1913.....	812

UNITED STATES DEPARTMENT OF AGRICULTURE PUBLICATIONS ABSTRACTED.

	Page.
Annual Reports, 1912.....	491, 493, 496
Report 97.....	762
Bulletin 1.....	878
Circular 43.....	144
44.....	342
45.....	636
Journal of Agricultural Research, vol. 1, No. 1, October, 1913.....	839, 857, 886
Farmers' Bulletin 525.....	472
526.....	159
527.....	194
528.....	171
529.....	233
530.....	385
531.....	280
532.....	299
533.....	230
534.....	233
535.....	459
536.....	280
537.....	335
538.....	542
539.....	542
540.....	559
541.....	580
542.....	542
543.....	561
544.....	549
545.....	538
546.....	534
547.....	656
548.....	635
549.....	696
550.....	633
551.....	639
552.....	738
553.....	743
554.....	743
555.....	751
556.....	869
557.....	855
558.....	896
559.....	864
560.....	896
Food Inspection Decision 151.....	566
152.....	766
Yearbook, 1912.....	414, 416,
419, 428, 430, 436, 444, 451, 452, 453, 454, 462, 472, 473, 476, 491, 492, 494, 496	
BUREAU OF ANIMAL INDUSTRY:	
Bulletin 160.....	276
161.....	73
162.....	71
163.....	82

BUREAU OF ANIMAL INDUSTRY--Continued.

Page.

Bulletin 164.....	70
165.....	475
166.....	109
167.....	287
Circular 210.....	75
211.....	107
212.....	204
213.....	778
214.....	782
215.....	783
216.....	778
217.....	776
218.....	776
Twenty-eighth Annual Report, 1911.....	717, 718, 770, 774, 776, 778, 780, 782, 793

BUREAU OF BIOLOGICAL SURVEY:

Bulletin 45.....	352
Circular 92.....	554
93.....	555
94.....	852
North American Fauna, No. 35.....	755

BUREAU OF CHEMISTRY:

Bulletin 163.....	263
164.....	160
165.....	207
166.....	265
Circular 113.....	11
114.....	12
115.....	87

BUREAU OF ENTOMOLOGY:

Bulletin 111.....	254
117.....	261
122.....	563
124.....	855
125.....	854
127, pt. 1.....	455
pt. 2.....	455
27, pt. 1 (technical series).....	54
Circular 168.....	53
169.....	57
170.....	58
171.....	53
172.....	360
173.....	356

FOREST SERVICE:

Bulletin 121.....	43
122.....	43
123.....	119
125.....	43
126.....	344
127.....	614
Circular 215.....	44
216.....	44

FOREST SERVICE—Continued.

Page.

Forest Atlas, pt. 1.....	149
Review Forest Service Investigations, vol. 2.....	531, 533, 543, 570

BUREAU OF PLANT INDUSTRY:

Bulletin 269.....	38
270.....	7
271.....	13
272.....	34
273.....	238
274.....	37
275.....	237
276.....	13
277.....	48
278.....	33
279.....	130
280.....	154
281.....	153
282.....	424
283.....	428
284.....	825
285.....	825
Circular 119.....	31, 33, 42, 87
120.....	30, 31, 32, 35, 41, 47
121.....	32, 36, 48
122.....	137, 141, 148
123.....	140
124.....	226, 229, 248
125.....	233
126.....	327, 330, 338, 347
127.....	330, 336, 347, 361
128.....	312, 391
129.....	540, 542, 554
130.....	528, 534, 590
131.....	527, 532, 553
132.....	633, 634, 689
Document 803.....	193
883.....	193
884.....	194

BUREAU OF SOILS:

Bulletin 94.....	214
95.....	25
Circular 76.....	25
79.....	125
Field Operations, 1910 (Twelfth Report).....	16

BUREAU OF STATISTICS:

Circular 47.....	296
Crop Reporter, Vol. XV, No. 4, April, 1913.....	186, 190
5, May, 1913.....	296
6, June, 1913.....	493

WEATHER BUREAU:

Bulletin 40.....	121
41.....	120
42.....	120
43.....	415

WEATHER BUREAU—Continued.	Page.
Bulletin 44.....	415
W, sections 1-57.....	121
sections 58-106.....	121
X.....	120
Bulletin Mount Weather Observatory, vol. 5, pt. 4.....	120
pt. 5.....	314
pt. 6.....	721
6, pt. 1.....	720
Monthly Weather Review, vol. 41, Nos. 1-2, January-February, 1913...	120, 181
3-4, March-April, 1913.....	510, 511
5-6, May-June, 1913.....	721
7-8, July-August, 1913.....	812
Report, 1912.....	209
OFFICE OF EXPERIMENT STATIONS:	
Bulletin 254.....	588
255.....	299
256.....	790, 792
Food and Diet Charts 1-15 (revised).....	766
Annual Report, 1912.....	897, 898, 899
OFFICE OF PUBLIC ROADS:	
Bulletin 48.....	388
Circular 99.....	590
100.....	688
DIVISION OF PUBLICATIONS:	
Bulletin 10.....	599
OFFICE OF THE SOLICITOR:	
Circular 70.....	61
Laws Applicable to U. S. Department of Agriculture (revised), 1912.....	899
Laws Applicable to U. S. Department of Agriculture, 1912, First Supplement.....	899
LIBRARY:	
Monthly Bulletin, vol. 4, Nos. 3-4, March-April, 1913.....	299
5-6, May-June, 1913.....	599

ILLUSTRATION.

FIG. 1. Humidity regulator, general view.....	107
--	------------

ADDITIONAL COPIES
OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
15 CENTS PER COPY
SUBSCRIPTION PRICE, PER VOLUME OF 9 NUMBERS AND INDEX, \$1



EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director*.
Assistant Editor: H. L. KNIGHT.

EDITORIAL DEPARTMENTS.

Agricultural Chemistry and Agrotechny—L. W. FETZER, Ph. D., M. D.
Meteorology, Soils, and Fertilizers—W. H. BEAL.
Agricultural Botany, Bacteriology, and Vegetable Pathology { W. H. EVANS, Ph. D.
W. E. BOYD.
Field Crops { J. I. SCHULTE.
G. M. TUCKER, Ph. D.
Horticulture and Forestry—E. J. GLASSON.
Foods and Human Nutrition { C. F. LANGWORTHY, Ph. D., D. Sc.
H. L. LANG.
Zootechny, Dairying, and Dairy Farming—E. W. MORSE.
Economic Zoology and Entomology—W. A. HOOKER, D. V. M.
Veterinary Medicine { W. A. HOOKER.
L. W. FETZER.
Rural Engineering—R. TRULLINGER.
Rural Economics—B. B. HARE.
Agricultural Education—C. H. LANE.
Indexes—M. D. MOORE.

LIBRARY
NEW YORK
BOTANICAL
GARDEN.

CONTENTS OF VOL. XXIX, NO. I.

Editorial notes:	Page.
Fourth session of the General Assembly of the International Institute of Agriculture	1
Recent work in agricultural science	7
Notes	96

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Contributions to the study of maize deterioration, Alsberg and Black	7
Influence of certain acid-destroying yeasts upon lactic bacteria, Northrup	8
Properties of some casein and paracasein compounds, Van Slyke and Bosworth	9
Quantitative separation and determination of subsidiary dyes, Mathewson	11
Identification of small amounts of dyestuffs with bromin, Mathewson	12
Sampling cane for chemical analysis, Crawley	12
Refrigeration on sulphured and unsulphured hops, Stockberger and Rabak	13
The utilization of waste raisin seeds, Rabak	13

METEOROLOGY—WATER.

A method of approximating rainfall over long periods, Douglass	14
Weather conditions and statistics, Harcourt	15
Phenology and climatology in the service of agriculture, Jochimsen	15
The movement of subterranean waters, Versluys, trans. by Dasselso	15
Text-book of ground water and springs, Keilhack	15
Geology and water resources of a portion of south-central Washington, Waring	15
Our artesian waters, Symmonds	16
Rain as a drinking water supply in British Guiana, Wise and Minett	16
The experience of the State of Indiana with the shallow well	16

SOILS—FERTILIZERS.

	Page.
Field operations of the Bureau of Soils, 1910, Whitney et al.	16
[Porto Rico soils], Zerban.	17
The nature of the dry farm soils of Utah, Widtsoe and Stewart.	18
The soil of the Southern Utah Experiment Station, Widtsoe and Stewart.	18
Two volcanic loams of Japan, Seki.	18
The mineralogical analysis of soils, Fry.	19
Soil and crop and their relation to state building, Hume.	19
The action of the soil on substances in suspension and in solution, Petit.	19
Effect of mixing with a lighter soil moor soil, marl, clay, and straw, Gerlach.	19
Improvement of an agricultural soil near Rome, De Angelis d'Ossat.	19
Action of soils containing graphite on germinating and growing plants, Kryz.	19
Soil temperature in its relation to plant growth, Naegler.	19
Bacterial activity as a function of grain size and moisture content, Rahn.	20
Bacterial activity and size of soil particles and water content, Rahn.	20
Nitrifying and ammonifying powers of North Carolina soils, Stevens et al.	21
Miscellaneous nitrification experiments, Stevens, Withers, et al.	21
The intensity of nitrification in arid soils, Stewart.	21
Water-soluble matter in soils sterilized and reinoculated, Lyon and Bizzell.	22
Studies in plant nutrition, II, Jordan.	22
Action of fermenting manure on phosphates, Tottingham and Hoffman.	23
Nitrogenous fertilizers for field crops, Malpeaux.	23
Relation of the production of alumina to fixation of nitrogen, Tucker.	24
Ammonium sulphate from ammonia and sulphur dioxide, Feld.	24
The electrotechnical production of ammonia.	24
Manufacture and uses of cyanamid, Franke.	24
On calcium cyanamid as a fertilizer, Sebelien.	24
Is it wise to mix cyanamid with superphosphate? Christensen.	24
Production of phosphate rock in Florida during 1912, Sellards.	25
Utilization of acid and basic slags in manufacture of fertilizers, Waggaman.	25
Alunite and kelp as potash fertilizers, Skinner and Jackson.	25
Liming for Tennessee soils, Mooers.	25
Investigations on the fertilizing action of sulphur, Demolon.	25
The fertilizing action of sulphur, Demolon.	26

AGRICULTURAL BOTANY.

The cause of growth in plants, I, Borowikow.	26
The rôle of acids in germination, Promsy.	26
Sunlight and plant assimilation, Müntz.	26
The effect of supramaximal temperatures on plants, Lepeschkin.	27
Is the form of trees determined by wind? Jaccard.	27
Sex anomalies in hops and hemp by diminished transpiration, Tournois.	27
Estimating the respiratory quotient of green plants, Maquenne and Demoussy.	27
Apparent fallacies of electrical response in cotton plants, Balls.	27
Recent studies on carbon assimilation, Pollacci.	28
Variations in the sodium-chlorid content of nonhalophytes, Blackledge.	28
The occurrence of manganese in plants, Jadin and Astruc.	28
Substitution of glucinium in cultures of <i>Sterigmatocystis nigra</i> , Javillier.	28
Replacement of zinc by glucinium in cultures of <i>Aspergillus niger</i> , Lepierre.	28
Decomposition of urea, uric acid, hippuric acid, and glycocoll, Kossowicz.	28
Assimilation of nitrites by mold fungi, I, Kossowicz.	29
The relation of some mold fungi to calcium nitrate, I, II, Kossowicz.	29
The assimilation of guanin and guanidin by mold fungi, I, Kossowicz.	29
Sulphocyanic compounds for mold fungi, I, Kossowicz and von Gröller.	29
Relations of yeast and mold fungi to sodium thiosulphate, Kossowicz and Loew.	29
Relations of yeast and mold fungi to sodium thiosulphate, Kossowicz and Loew.	30
Spore formation in <i>Aspergillus fumigatus</i> , Sauton.	30
Bacterial tubercles in leaves, Miehle.	30
Testing cultures of nodule-forming bacteria, Kellerman.	30
Smoke injury to plants, Bokorny.	30
The weeds of arable land, III, Brenchley.	30
Constitution of latex of Euphorbia and systematic position, von Wiesner.	30
Heterozygosis in evolution and in plant breeding, East and Hayes.	31
The improvement of medicinal plants, Miller.	31

FIELD CROPS.

Page.

Plowing and cultivating soils in California, Lipman.....	31
[Report of the] division of agronomy, Williams.....	31
Second annual report of the Miami County experiment farm, McIntire.....	31
The work of the Belle Fourche experiment farm in 1912, Aune.....	31
The work of the San Antonio experiment farm in 1912, Hastings.....	31
[Crop experiments at San Antonio experiment farm], Hastings.....	32
The work of the Huntley experiment farm in 1912, Hansen.....	32
Experiments with field peas and soy beans, White.....	32
Alfalfa, Clarke.....	32
Nitrogen and mineral constituents of the alfalfa plant, Ames and Boltz.....	32
Arabian alfalfa, McKee.....	33
Floral abnormalities in maize, Kempton.....	33
Heredity of a maize variation, Collins.....	34
Inheritance of waxy endosperm in sweet-corn hybrids, Collins and Kempton.....	35
Economic value of corn suckers, Williams and Etheridge.....	35
Cotton experiments, 1912.....	35
Methods of securing self-pollination in cotton, Meade.....	36
The culture of Durango cotton in the Imperial Valley, McLachlan.....	36
Oats, Williams and Welton.....	36
Selection of seed potatoes in South Dakota, Hume and Champlin.....	37
[Cultivation and fertilizer experiments with sugar cane], Crawley.....	37
Wild wheat in Palestine, Cook.....	37
Experiments in wheat breeding, Montgomery.....	38
Seed tests made at the station during 1912, Munn.....	40
Does the farmer get pure seeds? Hall.....	40

HORTICULTURE.

Proceedings of the Society for Horticultural Science, 1912.....	40
Horticultural work [at San Antonio experiment farm in 1912], Hastings.....	41
The woody plants of Kentucky, Garman.....	41
Early cabbage, Green.....	41
Chili culture, Erdozain.....	41
An orchard survey of Dundas, Stormont, and Glengarry, Reeves.....	41
Apples, old and new, Hedrick and Howe.....	41
The best apples for New York State, Hall.....	42
[Cultural experiments with apples].....	42
The family apple orchard, Green.....	42
[Cacao manurial plats in Dominica], Tempany.....	42
Mango culture in India, Popenoe.....	42
The grafted papaya as an annual fruit tree, Fairchild and Simmonds.....	42
Garden design in theory and practice, Agar.....	42
Commercial arsenates of lead and lime-sulphur, Thatcher.....	42
Spraying calendar for 1913, Melander and Humphrey.....	42

FORESTRY.

Michigan trees.—A handbook of native and introduced species, Otis.....	43
Tapping <i>Boswellia serrata</i> trees in the United Provinces, Pearson.....	43
The production of poplar wood and extension of the industry.....	43
Mechanical properties of western larch, Goss.....	43
The composite type on the Apache National Forest, Greenamyre.....	43
Forestation of the sand hills of Nebraska and Kansas, Bates and Pierce.....	43
California Redwood Park, Taylor.....	44
Forest administration in Baluchistan 1911-12, Mulraj and Dobbs.....	44
The seed test in word and picture, Busse.....	44
Effect of forest fires on standing hardwood timber, Long.....	44
Pith-ray flecks in wood, Brown.....	44

DISEASES OF PLANTS.

Meteorological conditions and plant diseases, Schander.....	44
Examples of disease control in practical operations, Schander.....	45
Report of the pathologist, Johnston.....	45
Report of the Union plant pathologist and mycologist for 1911, Evans.....	45

	Page.
Some diseases and enemies of cultivated plants in the far East, I, Duport	46
Report on plant diseases, 1910-11, Darnell-Smith	46
Contributions on the Ustilaginæ, Rawitscher	46
A contribution on the dry spot of cereals, Kuhnert	46
A leaf spot of cereals, Krause	46
Contributions on the biology of the Fusaria of cereals, Schaffnit	47
Apparatus for control of smut, Riehm	47
Leaf cut, or tomosis, a disorder of cotton seedlings, Cook	47
A dry rot of the Irish potato tuber, Wilcox	47
A dry rot of the Irish potato tuber, Wilcox, Link, and Pool	47
A dry rot of the Irish potato tuber, Wilcox and Link	48
A biochemical study of the curly top of sugar beets, Bunzel	48
The control of the sugar beet leaf spot, Pool and McKay	48
A new leaf spot of cucumbers in Saxony, Naumann	48
Some diseases of garden plants and frost injuries of apples, Naumann	48
Injury to vegetation by oxalic compounds and absorption of foul gases, Muth ..	49
A twig disease of fruit trees due to bacteria, Osterwalder	49
Notes on three limb diseases of apple, Wilson	49
Infection of apple leaves by cedar rust, Fulton	50
Rust of pear trees, Osterwalder	50
The Monilia disease of quinces (<i>Monilia linhartiana</i>), Pieper	50
Rusts of blackberries, dewberries, and raspberries, Wilson	50
Observations on control of American gooseberry mildew, Biermann	50
The control of downy mildew in 1912, Sauret	50
Causes of failure in treating vines for mildew in 1912, Castelli	50
A study of the disease produced by <i>Rhizoctonia violacea</i> , Eriksson	50
A note on the possible occurrence of a bacterial disease of Hevea, Bateson ..	51
On <i>Spharella macularis</i> , Traverso	51
A witches' broom on sycamore maple, Solereder	51

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Some Ohio birds, Gossard and Harry	51
The Lewis woodpecker, a destroyer of almonds, Bryant	51
The economic value of the western meadow lark in California, Bryant	52
The instinct of insects, Fabre	52
The poison exponent: A symbol of the toxicity of chemicals, Holloway	52
[Report of the] division of entomology, Metcalf	52
Report of the entomologist, Van Dine	52
Report of the superintendent of entomology, Ehrhorn	53
Sugar-cane insects in the United States in 1912, Holloway	53
Enemies of the coconut palm, Zacher	53
Insect destruction of fire-killed timber in the Black Hills, Buttrick	53
Distribution and species forming of ectoparasites, Kellogg	53
The 1912 chinch bug campaign in Illinois, Forbes	53
Preliminary list of the scale insects of South Carolina, Gee	53
The San José scale in Tennessee with methods for its control, Bentley	53
Spraying for white flies in Florida, Yothers	53
Classification of the Aleyrodidæ, I, Quaintance and Baker	54
The sugar-beet webworm (<i>Loxostege sticticalis</i>), Paddock	54
A serious walnut pest (<i>Ephesia elutella</i>), Maskew	54
The blood-sucking Ceratopogoninæ of Brazil, Lutz	54
The biology of blood-sucking Diptera, Lutz	54
Will the Mediterranean fruit fly breed in bananas? Severin and Hartung	54
Cherry fruit flies and how to control them, Illingworth	55
A remedy for chrysanthemum leaf miner, Sanders	55
Report on rat fleas in Suffolk and North Essex, Strickland and Merriman	55
Life history and habits of <i>Trogoderma tarsale</i> , a museum pest, Wodsdalek	55
Biological record of little grass billbug (<i>Sphenophorus parvulus</i>), Smith	56
[Report of work with the corn billbug (<i>Sphenophorus callosus</i>)], Smith	56
Notes on <i>Lixus concavus</i> , Weiss	56
Coleoptera: General introduction and Cicindelidæ and Paussidæ, Fowler	57
Diptera: Nemtocera (excluding Chironomidæ and Culicidæ), Brunetti	57
An introduction to bee culture, Warry	57
A handbook of bee keeping.—IV, The life of the bee, Zander	57
Rearing queen bees, Warry	57

	Page.
Bee diseases in Ontario, Pettit.....	57
Sacbrood, a disease of bees, White.....	57
The poison of the hornet (<i>Vespa crabro</i>), Bertarelli and Tedeschi.....	57
Note on a parasite of white grubs, Flint and Sanders.....	58
Observations on the biology of Ixodidae, Nuttall.....	58
The fowl tick (<i>Argas miniatus</i>), Bishopp.....	58
The anatomy of <i>Argas persicus</i> , Robinson and Davidson.....	58
An acarid enemy of the linden, Bouvier.....	58
An introduction to the study of the Myriapoda, Porter.....	58
<i>Bacterium pseudopestis murium</i> n. sp., Galli-Valerio.....	58

FOODS—HUMAN NUTRITION.

Chemical changes in meats during drying in vacuum, Davis and Emmett.....	58
Analysis of meat preparations, Perrier and Farcy.....	58
Notes on preserving eggs in China, Hanzawa.....	59
[Chemical examination of milk and ice cream], Halverson.....	59
Cheese, McGill.....	59
The nutritive value of overripe cheese, Kühl.....	59
Studies of yoghurt, with special reference to dried preparations, Hohenadel.....	59
Important vegetable foodstuffs of natives in German protectorates, Adlung.....	59
Soluble nitrogen as a factor in judging flours, Rousseaux and Sirot.....	60
The technique of sour dough fermentation, Neumann and Mohs.....	60
Vegetables—their food value and preparation, Jefferson and Edmonds.....	60
Candy making revolutionized—confectionery from vegetables, Hall.....	60
Canned tomatoes, McGill.....	60
Soaking nuts, Rigotard.....	60
The adulteration of jams, Marriage.....	60
Fifth annual report of the food and drug commissioner of Texas, Abbott.....	61
[Chemical examination of foods and dairy products], Emery et al.....	61
Manual of the Illinois Dairy and Food Law, sanitary food law, etc.....	61
The dairy and food laws of Michigan with supreme court decisions.....	61
The food and drugs act.....	61
Childs recipes for cooking and preparing—serving and portion list.....	61
Methods of metabolism experiments with men and animals, Weitzel.....	62
The amount of water required by infants, Meyer.....	62
The regulation of neutrality in the animal body, Henderson.....	62
Studies of the excretion of acid, Henderson and Palmer.....	62
The nutritive value of the proteins of maize, Osborne and Mendel.....	62
Utilization of ammonia nitrogen in protein metabolism, Taylor and Ringer.....	62
Are the purin bodies intermediate or terminal metabolic products? Siven.....	63
Are endogenous purin bodies products of activity of digestive secretions? Siven.....	63
Transformations of sugars in the human organism, Parnas and Baer.....	63
Transformations of the carbohydrates in the animal organism, Parnas.....	63
Studies on the formation of glycocoll in the body, II, Epstein and Bookman.....	63
Influence of the mineral content of the ration on growth, McCollum and Davis.....	64
[Calcium and magnesium in Asiatic foodstuffs], Abderhalden and Hanslian.....	64
On the question of food-poisoning bacteria, Mayer.....	64

ANIMAL PRODUCTION.

A contribution to the theory of growth, Kellicott.....	64
On the energy expenditure required for growth, Gouin and Andouard.....	65
Sugar in the nutrition of man and animals, Crochetelle.....	65
Lignocelluloses and animal assimilation, Cross.....	65
Influence of function on lime requirements of animals, Steenbock and Hart.....	65
Effect of high magnesium intake on calcium retention, Hart and Steenbock.....	66
Diet deficiency and disease in live stock, Place.....	66
In regard to the normal pulse rate of mammals, Knoll.....	66
The direct transfer of food and drink of ruminants through swallowing, Völtz.....	66
The biochemistry of the female genitalia, Erpf-Lefkovich and Rosenbloom.....	66
Influence of the spermatozooids on the blastula, II, Kohlbrugge.....	66
The significance of artificial impregnation in mammals, Iwanoff.....	66
Nucleus and cytoplasm in inheritance, Schreiner.....	66
Tetraplasy, the law of the four inseparable factors of evolution, Osborn.....	67
Concerning the problem of the carriers of heredity, Vejdovsky.....	67

	Page.
Mendelism and interspecific hybrids, Cook.....	67
A simple test of the goodness of fit of Mendelian ratios, Harris.....	67
Simplification of Mendelian formulas, Castle.....	68
The principles of stock breeding, Wilson.....	68
The descent of animals, Jessen.....	68
Biology of cattle, Wilson.....	68
Inheritance of the poll character in cattle, Spillman.....	68
A comparison between the Chiana and Romagna breeds, Pucci.....	68
The Tarentaise cattle from a zootechnical and industrial standpoint, Hoffmann..	68
On the determination of hemoglobin in cattle, Dettweiler.....	68
Economic importance of corn silage in southern beef production, Curtis.....	69
A contest in wool, Plumb.....	69
The Mocha goatskin trade of Red Sea region, Schulz.....	69
The utilization of feeding stuffs by the zebu, Pucci.....	69
Pork production, Thompson.....	69
Cooperative pig-fattening establishment for Ulm and Neu Ulm, von Braun.....	69
Biological searchlight on race-horse breeding, Robertson.....	69
The Arabian national stud book.....	69
The home poultry book, Farrington.....	69
Castration in relation to secondary sexual characters of Leghorns, Goodale....	69
On the origin of double-yolked eggs, Glaser.....	69
The laying competition at Storrs.....	70
Farm poultry and egg marketing conditions in Ontario County, Hare and Benson	70
Export of eggs.....	70
Poultry work at Oregon Experiment Station, Hunter.....	70
Dedication of \$90,000 poultry building, Norys.....	70
Fur-bearing mammals: An unappreciated natural resource, Taylor.....	70
Mink farming, White.....	70
Results of German animal census, Thackara.....	70

DAIRY FARMING—DAIRYING.

Dairy herd records.....	70
Advantages in testing pure-bred cows for the register of merit, Hill.....	71
Detecting dairy losses, Davis.....	71
Increasing dairy profits, Van Norman.....	71
Care of milk and cream on the farm, Frandsen.....	71
The dairyman's relation to quality, Davis.....	71
Factors influencing the change in flavor in storage butter, Rogers et al.....	71
A study of the bacteria which survive pasteurization, Ayers and Johnson, jr..	73
A comparison of the acid test and the rennet test, Hastings and Evans.....	75

VETERINARY MEDICINE.

Cotton-seed meal intoxication.—I, Pyrophosphoric acid, Withers, Ray, et al..	76
Feeding and toxicity of cotton-seed meal, Curtis.....	76
[Report of the] division of veterinary science, Roberts.....	77
The identification of the woody aster.....	77
Disinfection on the farm, Haring.....	77
Trypanosomes and trypanosomiases, Lavarán and Mesnil.....	77
Fate of tubercle bacilli outside the animal body, Briscoe.....	77
Tuberculosis in the university dairy herd, Hayden.....	78
Tuberculosis in cattle and hogs, Haring.....	79
On the infectious abortion of the cow, Zwick and Zeller.....	80
Biological investigations of the abortion bacillus, Zwick and Wedemann.....	80
Infectious abortion and sterility in cattle, Giltner.....	80
Infectious abortion and sterility in cows, Haring.....	81
Johne's disease in sheep, Twort and Ingram.....	81
Concerning piroplasmosis of sheep, von Rátz.....	81
Sarcosporidiosis in sheep in Scotland, McGowan and Rettie.....	81
The antigen responsible for the antibodies in Dorset-Niles serum, Giltner.....	82
Hog cholera and its prevention, Haring.....	82
Some animal parasites of the Miami County hog, Mote.....	82
The life history of <i>Habronema muscæ</i> , a parasite of the horse, Ransom.....	82
[Equine piroplasmosis in the Canal Zone].....	83
The value of the ventricle stripping operation for roaring, Hobday.....	83
The frequency of trichinosis in dogs and cats, Hjortlund.....	83

	Page.
On a hepatic blastomycosis of geese, Martin and Daille.....	83
Aspergillosis of canaries, De Jong.....	84

RURAL ENGINEERING.

Biennial report of the State engineer of Wyoming, Parshall.....	84
Water powers of the Cascade Range, II, Henshaw and Parker.....	84
Experience with wood-stave pipe in irrigation, Tiffany.....	84
Irrigation, Peters et al.....	84
Irrigation.....	85
Land drainage, Walker.....	85
Plans for reclamation of lands in Kaskaskia River Valley, Ill., Harman.....	85
River bank experimental road.....	85
Modern technical building and construction methods, Gamann.....	86
The manufacture of manila rope, Hunt.....	86
Some observations and experiments on the tractive power of horses.....	86
The gasoline engine on the farm, Putnam.....	86
Experiments in motor cultivation at Bourges, Coupau.....	86
The status of motor cultivation, Kasdorf.....	87
A hand grain thresher, Briggs.....	87
Spraying machinery accessories, Goodwin.....	87
An all metal poultry cooling rack, Pennington and Pierce.....	87
The construction of dipping tanks for cattle.....	87
Modern silage methods.....	87
Tests of a centrifugal cream separator, Sanfelici.....	88
The use of fuel in creameries, von Merkatz.....	88
Ice cold storage on the farm, Graham.....	88
Lightning protection of buildings, Berg.....	88
The sanitary privy.....	88

RURAL ECONOMICS.

Agriculture, 1909 and 1910.—VI, Reports by States (Alabama—Montana).....	88
The agricultural census of France, De Fontgalland.....	89
Farm management in German agriculture, Sagawe, et al.....	89
The profitability of the root crop production, Sagawe.....	89
The advantages and disadvantages of machinery in farm operations, Schnider.....	89
The agricultural activities of the Jews in America, Robinson.....	89
Cooperation in agriculture, Powell.....	89
Farm credits, Dos Passos.....	90
[A land bank for South Africa].....	90
Ninety million dollars loaned by State to farmers, Duffus.....	90
A plan for the organization of a rural banking system in Virginia, Davis.....	91
How a system of farm credits will benefit the farmer, Jackson.....	91

AGRICULTURAL EDUCATION.

The rural school as a center of country life, Dabney.....	91
The rural school of to-day and ten years hence, Lane.....	91
[Rural school improvement].....	91
The teaching of agriculture in the public schools of Illinois, Madden.....	91
Winnebago County schools annual reports, Kern.....	91
Special report on agriculture and domestic science.....	92
The teaching of agriculture in the rural schools of Texas, Winkler.....	92
Agricultural education.....	92
Agricultural instruction under the supervision of the chamber of agriculture.....	92
Practical training of farm managers, Langenbeck.....	92
Agricultural home economics instruction for women, Bussard.....	92
Project for organization of professional agricultural instruction in France.....	92
Course of study in industrial education for the schools of New Mexico, Myers.....	92
A one-year course in secondary agriculture, Bricker.....	92
An outline of a year's work in beginning agriculture, Copeland.....	93
Laboratory manual for elementary agriculture, Wilson.....	93
The agricultural booklet, Lane.....	93
Dairy laboratory guide, Martin.....	93
Exhibits of grains, grasses, and legumes for farm and school use, Arny.....	93

	Page.
Classified bibliography of home economics books, Comstock and Palmer.....	93
A simple method of cataloguing agricultural pamphlets, Lane.....	93
Boys' and girls' clubs, Martin.....	93
Agricultural contests.....	93
Bean growing contest, Griffin.....	94
Suggestions regarding the teaching of vegetable gardening, Lloyd.....	94
The demonstration orchard as a factor in horticultural education, Rees.....	94
Successful vacant lot gardens, Dix.....	94
Vacant lot gardening in Minneapolis, Boughner.....	95
Neighborhood improvement clubs, Holton.....	95
Illinois farmers' institute: Department of household science.....	95

MISCELLANEOUS.

Thirty-fifth Annual Report of North Carolina Station, 1912.....	95
[First Report of the Porto Rico Sugar Growers' Association Station, 1911].....	95
Second Annual Report of Porto Rico Sugar Producers' Station, 1912.....	95

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

Stations in the United States.

California Station:	Page.
Bul. 236, Feb., 1913.....	52
Circ. 87.....	32
Circ. 88.....	71
Circ. 89.....	82
Circ. 90.....	79
Circ. 91.....	77
Circ. 92.....	81
Circ. 93, Mar., 1913.....	94
Circ. 94.....	71
Circ. 95.....	71
Circ. 96.....	69
Circ. 97.....	71
Circ. 98.....	31
Illinois Station:	
Bul. 161, Nov., 1912.....	77
Bul. 162, Jan., 1913.....	78
Kentucky Station:	
Bul. 169, Jan. 1, 1913.....	41
Michigan Station:	
Tech. Bul. 13, June, 1912.....	82
Tech. Bul. 14, June, 1912.....	80
Tech. Bul. 15, June, 1912.....	8
Tech. Bul. 16, June, 1912.....	20
Mississippi Station:	
Bul. 161, Feb., 1913.....	35
Nebraska Station:	
Bul. 133, Oct. 21, 1912.....	71
Bul. 134, Mar. 25, 1913.....	48
Research Bul. 1, Mar. 1, 1913..	47
New York Cornell Station:	
Bul. 325, Dec., 1912.....	55
Bul. 326, Jan., 1913.....	22
New York State Station:	
Bul. 360, Feb., 1913.....	22
Bul. 361, Mar., 1913.....	41, 42
Bul. 362, Feb., 1913.....	40
Tech. Bul. 26, Dec., 1912.....	9
North Carolina Station:	
Thirty-fifth An. Rpt. 1912:...	21,
31, 35, 49, 50, 52, 56, 69, 76, 77, 95	
Ohio Station:	
Bul. 247, June, 1912.....	32
Bul. 248, June, 1912.....	87
Bul. 250, Aug., 1912.....	51
Bul. 252, Dec., 1912.....	41
Bul. 256, Feb., 1913.....	31, 42, 82
Bul. 257, Feb., 1913.....	36
Porto Rico Sugar Producers' Station:	
Bul. 1, 1911.....	95
Second An. Rpt. 1912.....	12,
17, 37, 45, 52, 95	
Irrigation, 1912.....	85
South Dakota Station:	
Bul. 139, Aug., 1912.....	19
Bul. 140, Jan., 1913.....	37

Stations in the United States—Contd.

Tennessee Station:	Page.
Bul. 97, Jan., 1913.....	25
Bul. 98, Apr., 1913.....	53
Utah Station:	
Bul. 121, Jan., 1913.....	18
Bul. 122, Jan., 1913.....	18
Washington Station:	
Popular Bul. 50, Jan. 30, 1913..	32
Popular Bul. 51, Feb. 20, 1913..	42
Popular Bul. 52.....	42
Wyoming Station:	
Bul. 97, Apr., 1913.....	77
<i>U. S. Department of Agriculture.</i>	
Bureau of Animal Industry:	
Bul. 161.....	73
Bul. 162.....	71
Bul. 163.....	82
Bul. 164.....	70
Circ. 210.....	75
Bureau of Chemistry:	
Circ. 113.....	11
Circ. 114.....	12
Circ. 115.....	87
Bureau of Entomology:	
Bul. 27, pt. 1 (tech. ser.).....	54
Circ. 168.....	53
Circ. 169.....	57
Circ. 170.....	58
Circ. 171.....	53
Forest Service:	
Bul. 121.....	43
Bul. 122.....	43
Bul. 125.....	43
Circ. 215.....	44
Circ. 216.....	44
Bureau of Plant Industry:	
Bul. 269.....	38
Bul. 270.....	7
Bul. 271.....	13
Bul. 272.....	34
Bul. 274.....	37
Bul. 276.....	13
Bul. 277.....	48
Bul. 278.....	33
Circ. 119.....	31, 33, 42, 87
Circ. 120.....	30, 31, 32, 35, 41, 47
Circ. 121.....	32, 36, 48
Bureau of Soils:	
Bul. 95.....	25
Circ. 76.....	25
Field Operations, 1910	
(Twelfth Rpt.).....	16
Office of the Solicitor:	
Circ. 70.....	61

EXPERIMENT STATION RECORD.

VOL. XXIX.

JULY, 1913.

No. 1.

The fourth session of the General Assembly of the International Institute of Agriculture, held at Rome May 6 to 12, has directed attention anew to the substantial progress which is gradually being attained by this unique enterprise. It was eight years ago that the institute, conceived by an American citizen, Mr. David Lubin of California, as a world's clearing house of agricultural information, first assumed tangible form. Under the patronage of the King of Italy the initial conference of representatives of forty countries met in Rome in May, 1905, formally established the institute, and outlined in a preliminary way its functions and work. Subsequently their action was ratified by most of the nations of agricultural importance and pledges secured of cooperation in its financial support. Permanent headquarters were established in Rome, where a palace for its use was erected by the Italian Government. As the years have gone by, the many complex problems incident to the organization of so novel and extensive an undertaking have been nearing solution, and each session of the General Assembly has marked another milestone of progress.

The General Assembly, it will be recalled by those familiar with the plan of organization of the institute,^a is the governing or legislative body. It usually meets biennially to review and approve the work of the "Permanent Committee," which is the executive body, to vote the institute budget, and to authorize any changes contemplated in the plan and methods of work. It is composed of special delegates appointed by the contributing countries, there being no restriction on the number of delegates but in the decision of questions each nation voting as a unit. At the recent assembly several representatives were sent by most of the fifty-three contributing countries. The delegates of the United States were Dr. A. C. True, designated by the Secretary of Agriculture; Prof. C. W. Pugsley, of the college of agriculture of the University of Nebraska; Prof. T. J. Brooks, of the Mississippi Agricultural and Mechanical College; Mr. Spencer Ewing of Bloomington, Ill.; and Mr. David Lubin, the

^a For more detailed accounts of the organization and activities of the institute see previous notes (E. S. R., 19, p. 501; 25, p. 5).

permanent delegate of the United States to the institute from its inception, and resident at Rome.

At the opening meeting, Count Francisco Guicciardini, delegate of Italy, was elected president of the assembly, and Baron Bernhard von Ehrenfels, of Austria, and Mr. Paul de Vuyst, of Belgium, vice presidents. The assembly was then divided into four large committees (called commissions), corresponding in a general way to the four bureaus of the institute, on each of which each country was represented by one or more delegates. The various reports, already prepared and printed setting forth the matters on which the assembly was to pass, were distributed to these commissions.

Commission I, on administration and finance, considered reports on the work of the institute for the past two years, submitted by Marquis Cappelli of Italy, president of the institute, and on the finances of the institute by M. Fialho, of Brazil. To Commission II, on statistics, was entrusted the reports on the crop reporting and statistical service, by Dr. Müller of Germany, on commercial statistics by M. Zabiello of Russia, and on statistics of live stock by Chevalier de Pozzi of Austria. Commission III, on agricultural intelligence and plant diseases, dealt with the reports on the statistics of fertilizers, by M. Pioda of Switzerland; the organization of an international service of agricultural meteorology, by M. Louis-Dop of France; the steps to be taken toward an international agreement for the control of plant diseases, by Professor Cuboni, representing Ethiopia; seed adulteration by M. de Jaczewski, of Russia; and the protection of birds and on dry farming, by M. de Miklós of Hungary. Agricultural cooperation was the subject of Commission IV, including the reports on statistics of agricultural cooperation, by Chevalier de Pozzi, and on insurance against damage to crops by hail, by M. Bolle of Belgium.

The recommendations contained in the reports had already been passed upon by the Permanent Committee of the institute. In some cases there was much discussion of certain recommendations in the respective commissions and important changes were made in them. Afterwards two general meetings of the assembly were held, at which the final reports of the commissions were received, debated, and adopted.

The administrative report, presented by Marquis Cappelli, briefly epitomized the progress of the institute since the preceding meeting in 1911. During this interval five additional countries, namely Paraguay, Guatemala, the Dutch East Indies, the Union of South Africa, and Tripolitania and Cyrenaica, have given their support to the institute, raising the total number contributing to fifty-three. Of these, sixteen have elected membership in what is known as group

1, contributing sixteen units of \$300 each per annum and casting five votes; four in group 2, with eight units and four votes each; two in group 3, with four units and three votes each; fifteen in group 4, with two units and two votes each; and the remainder in group 5, with one unit and vote each.

One of the principal topics presented to the commission on administration concerned the finances of the institute. The annual income derived from the various national contributions on the basis explained above amounts to \$102,600. This is supplemented by an annual grant of \$60,000 from the Kingdom of Italy and a considerable amount from the proceeds from the sale of publications. These revenues have of late proved inadequate to meet the increased expenditures attending the continued development of the work, and as a result the reserve fund accumulated in the earlier years has diminished from \$134,000 in 1910 to about \$119,000. A further decrease is expected to result temporarily from reducing the subscription price of the various periodicals, which is being contemplated with a view to extending their circulation and ultimately the receipts therefrom. It is also anticipated that the special Italian contribution must for a time be utilized in enlarging the institute building, which has already been outgrown. For these reasons action was taken by the General Assembly enlarging the subscription unit to \$500. This will increase the quota of group 1 nations, of which the United States is one, from \$4,800 to \$8,000 per annum.

The "acte finale" of 1905 establishing the institute prescribes as among its principal duties the collection, study, and publication of statistical, technical, and economic information of general agricultural interest, and more specifically those data relating to crop production, the combating of plant pests, prices and traffic in agricultural products in the world's markets, wages of farm labor, and agricultural cooperation, insurance, and credit. These activities have been discharged, in the main, by means of the numerous series of publications, and during the last two years these have been increased in number, the form and regularity of issue much improved, and the sources of material considerably extended. Particular attention has also been given to the more effective dissemination of their contents by publishing editions in other languages than French, the official language of the institute. This feature has been made possible by special contributions from the countries most concerned.

Thus, the principal publications are now available in English, the cost being defrayed by appropriations of \$5,000 each per annum by the United States and Great Britain. Italian, German, and Spanish editions are being supported in a similar way, and the Hungarian Government provides for the translation of certain portions of the publications. It is estimated that these six languages are the mother

tongues of almost six hundred million people, and in the opinion of President Cappelli "there could be no better proof of the value of our publications than the fact that the countries at the head of agricultural progress are publishing editions of them in their own languages at their own expense."

The publications of the institute during the biennium were augmented by the addition of two annuals and a considerable number of monographs. One of these has the title of *Annuaire de legislation agricole*, and is a collection in the French language of the laws of the various nations which relate to agriculture. The text of the more important enactments is given in full and others in abstract or by title, all being indexed by subject and by countries. The issue for 1912 appeared recently, thus affording a compilation of much timeliness and applicability.

The second new annual is the *International Yearbook of Agricultural Statistics*, instituted in accordance with plans evolved at the 1911 session of the General Assembly. As its name implies, this is a world review of statistics pertaining to the production of crops and live stock, and presents each year a large amount of tabular data on these items for the ten years preceding. Many difficulties were encountered in the preparation of this and other statistical publications of the institute, but it is announced that one result of its endeavors has been to aid greatly in stimulating interest in the collection of such data along uniform lines. The work under way in this direction received the commendation of the commission on statistics, and additional development was advocated, including continued cooperation by the Permanent Committee with the International Institute of Statistics, which meets in Vienna this autumn, and the collection of more detailed data as to live stock, meat production and consumption, and commerce in wheat, oats, rye, barley, corn, and cotton.

Another indication of the increased activities of the institute is afforded in the growth of the library, which has increased from 38,961 to 53,716 volumes. This is exclusive of the periodicals and similar material which form the principal sources of supply of the abstract journals, and now number over 2,200 and average about 250 pieces per day. It is of interest to note that these figures are substantially the same as those reported by the Library of the United States Department of Agriculture, the coincidence being the more remarkable since the similarity is doubtless mainly in numbers alone.

Some of the most important lines of work under way are those under the jurisdiction of the Bureau of Agricultural Intelligence and Plant Diseases and referred to Commission III. Much improvement has been achieved in the monthly *Bulletin* of the bureau, the comprehensive aim of which was stated by President Cappelli as follows:

"Our ideal would be that every important invention, all original research, every result arrived at in the theory or practice of agriculture, should be reported in our *Bulletin*, so that each one of our readers may be sure that there is nothing new and really important in technical agriculture but is brought under his eyes." This publication is now being issued regularly, the abstracts which form the bulk of its contents being derived from the periodicals and other publications received before the middle of the month preceding. Numerous original articles by authorities in various parts of the world are also being included and add much to its usefulness.

One of the principal difficulties reported in the preparation of the abstracts is very familiar to abstractors and translators in general, namely, the frequent lack of equivalents in the various languages for the large number of technical terms now in use by workers in agricultural science. They will, therefore, be interested to learn that with a view to simplifying this problem action was taken by the General Assembly instructing the Permanent Committee to consider the question of preparing and publishing a vocabulary of the principal terms employed in agriculture. Announcement was also made of a prospective office to answer inquiries submitted by the various nations on agricultural questions in general.

The bureau has cooperated with the International Meteorological Commission, which met in Rome the previous month, in the general promotion of agricultural meteorology. This topic has been urged for several years by M. Louis-Dop, of France, and others, and received much favorable consideration. Efforts are to be continued by the institute to stimulate interest throughout the world and to establish a permanent international commission of agricultural meteorology, composed of meteorologists, agronomists, botanists, phytopathologists, and agrogeologists, for the study of meteorological conditions as related to crop production.

The question most debated by both the commission and the General Assembly concerned the promulgation of an international agreement with reference to the control of plant diseases. A number of propositions were submitted on this subject, which was felt to present several aspects of unusual complexity. An unsuccessful effort to convoke at Rome a conference of specialists to study the problem in detail was reported. Under the agreement eventually reached, the maintenance in all countries of a governmental phytopathological service was recommended. The project for an international gathering of specialists was endorsed as indispensable and the hope was expressed that the French Government might take the initiative therein by calling such a conference not later than May, 1914.

With reference to the remaining projects of the Bureau of Agricultural Intelligence and Plant Diseases, resolutions were adopted affirm-

ing the international significance of the problem of the protection of birds useful in agriculture, and suggesting its further encouragement. The collection and dissemination of additional information regarding the results of seed inspection and of dry farming methods was advocated, and steps were taken to publish additional statistics relating to the production, consumption, and trade in commercial fertilizers.

The work of Commission IV dealt with the various phases of agricultural cooperation. According to the report of the Bureau of Economic and Social Intelligence, which has such questions in charge, there has been a marked increase in public interest in this subject and a strong demand for the publications of the bureau, specific mention being made of the reprinting by the United States Senate of the monograph entitled *Outline of European Credit Systems*. The General Assembly authorized the Permanent Committee to continue its work along these lines and to begin as soon as possible the regular publication of statistics relating to agricultural cooperation. A special inquiry on provisions for hail insurance was also reported, and the nations asked to aid this work by reports as to measures undertaken to foster such insurance, with a view to publication in the *Bulletin of the Bureau of Economic and Social Intelligence*.

Not the least important of the many valuable results from the sessions were those of a personal nature derived from the assembling of representatives of the world's greatest industry in a united and cooperative way. In recognition of this aspect much prominence was given as usual to the social features in connection with the meetings. On May 11 the King and Queen of Italy gave a reception to the assembly at the institute, to which were also invited the United States commission on rural credit and the similar commission assembled from the several States and Canada by the Southern Commercial Congress, who had arrived at Rome that day. A dinner was also given to these bodies by the Minister of Agriculture and a reception by the Minister of Foreign Affairs. The president of the institute gave a dinner to the delegates from the United States and Canada and the members of the United States commission.

On the whole, the assembly was an earnest and weighty body, and the matters presented were of much importance in their relation to the agricultural progress of the world. There was a general feeling, in which the American delegates concurred, that the institute was now firmly established, was already doing useful and valuable work, and had a good outlook for much greater usefulness in the future.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Contributions to the study of maize deterioration, C. L. ALSBERG and O. F. BLACK (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 270, pp. 48, pl. 1*).—The results of this investigation, continuing previous work (*E. S. R.*, 24, p. 409) furnish additional data for explaining the discrepancies in the various biochemical investigations of molds reported. It is maintained that previous investigators have failed to realize that the nature of the metabolic products varies with the species studied, with the reaction of the culture medium, with the amount of aeration given, and possibly with the nature of the nitrogen furnished as a food supply.

In this work 6 species of maize were studied, of which 2 were capable of elaborating substances which were toxic to mice. Two of these species, one toxic and the other nontoxic, were studied in detail. "The first, identified as *Penicillium puberulum*, elaborates a toxic product which was isolated and for which the name 'penicillic acid' and the formula $C_6H_6O_4$ are suggested. [It is not considered the substance isolated by Gosio, but probably related.] This substance behaves like a monobasic acid. It is toxic to animals when injected subcutaneously, causing death in a dosage of about 0.2 to 0.3 gm. per kilogram of body weight. The formation of penicillic acid is more abundant when the air supply is limited and the reaction of the medium is acid. The form in which nitrogen was offered the fungus seems also to have some influence on its formation."

A substance partly crystalline and partly oily, with a cresol-like odor, was noted among the metabolic products. Penicillic acid has some antiseptic properties.

"*P. puberulum* was always found to produce alcohol when grown in the presence of sugar. Old cultures contain minute amounts of oxalic acid. In the presence of sugar and leucin no amyl alcohol is produced, although leucin is consumed. A small quantity of volatile acid, however, is formed. In the presence of sugar and tyrosin neither tyrol nor tyrosol is produced, though tyrosin is consumed. A small quantity of volatile acid is formed.

"Both the culture fluid and the mycelium were examined for oxidizing enzymes. The former contains an abundance of catalase, though no oxidase detectable by guaiac, aloin, or benzidin. A very faint peroxidase reaction was found, due perhaps to the presence of chlorids. The statement of Loew, [*E. S. R.*, 13, p. 115] that filtered *P. glaucum* cultures contain only catalase is therefore amply confirmed."

The mycelium was tested for oxidizing power by the method of oxygen absorption developed by Bunzel (*E. S. R.*, 27, p. 9). Oxygen absorption was observed only when the mold was grown on Raulin's medium with an addition of 5 per cent of a mixture of 2 parts Na_2HPO_4 and 1 part NaH_2PO_4 .

"The second organism, *P. stoloniferum*, was nontoxic. Unlike the other 5 studied, it was isolated from Italian maize. It elaborates a new phenolic acid,

for which the name 'mycophenolic acid' and the formula $C_{17}H_{20}O_4$ are suggested. This substance behaves like a weak dibasic acid and, like penicillic acid, resembles the lichen acids in many ways. Among the other metabolic products of the organism, alcohol, oxalic acid, and mannitol were found.

"In the present paper it has been shown that species of *Penicillium*, so closely related that until recently they were not distinguished by morphologists, differ quite markedly in their metabolism. It is greatly to be desired that the whole genus be studied biochemically. The chemical findings will no doubt supplement the morphological in many important ways. Indeed, as indicated by the constant presence of alcohol and the formation of penicillic acid by *P. puberulum* and the formation of mycophenolic acid by *P. stoloniferum*, it is not impossible that characteristic chemical properties may help to distinguish between species or strains not now sharply separated by morphologists."

The influence of certain acid-destroying yeasts upon lactic bacteria, ZAE NORTHRUP (*Michigan Sta. Tech. Bul.* 15, pp. 3-35, figs. 5).—A chromogenic (red) yeast in addition to a yellow coccus was isolated from what was supposedly a pure culture of lactic acid bacteria. In order to preserve the strain of red yeast, transfers were made from milk to milk whereby it was noted that the milk first curdled before the characteristic pigmentation appeared. When lactic acid bacteria were cultivated together in the same media with this yeast, the bacteria seemed to retain their vitality over a much greater period than when they were cultivated alone. This was proved to be due to the acid-consuming or acid-reducing power of the yeast. The yellow coccus, while capable of producing acid, was a negligible factor so far as the preservation of the lactic acid bacteria was concerned.

In order to determine absolutely that the yeast was an acid reducer, it was compared with a scum yeast from brine pickles, a butter yeast, and a yeast isolated from whey. In this respect the pickle brine yeast was found to be the greatest consumer of acid and the red yeast the weakest one. The acid reduction in the case of the red yeast was considered of secondary importance. When grown together with either the *Bacterium bulgaricum*, another high acid-producing strain, or 2 organisms which were low producers of lactic acid, it was noted that no growth was obtained in the case of the strong, acid-producing bacteria but, on the other hand, the 2 lactic acid bacteria used were not alive, this being due to the long sojourn in their own products.

In some comparative tests of acid reduction made with mixed cultures of 4 yeasts and 4 lactic acid bacteria in milk and whey, some of which were strong acid producers and others weak, it was noted that it was quite possible to increase the acid-producing qualities of the weak acid strains by growing them in the same medium with a yeast having the characteristics of the red yeast.

The rejuvenating property of the yeasts, while due in part to the acid-producing function, in the case of red yeast is also partially due to rennet and pepsin-like enzymes produced by the yeast. One of these enzymes at least is extracellular in old cultures; the rennet-like enzyme and probably the pepsin-like enzyme were separated from yeast by filtration. Although it was difficult to determine the presence of the pepsin-like enzyme in the filtrate by means of its visible action on the milk, the stimulating action of the filtrate is directly comparable with that of the pure pepsin solution. The pepsin-like enzyme is the one which stimulates the curdling function of the lactic bacteria, although at first it was suspected that the lactic organisms in some way caused the rennin in the filtrate to act more quickly.

"The question was raised as to whether the enzymes acted upon the milk constituents and thus indirectly upon the lactic bacteria, or whether the influence was immediately upon the lactic bacteria. It was ascertained that the rennet

enzym in the filtrate acts in part upon the milk constituents, but the most marked action of the filtrate is upon the lactic bacterium itself; two principles of the filtrate are concerned in this, one destroyed and the other not destroyed by heat. The former is most likely the pepsin-like enzym or the combined pepsin and rennin, and the latter, certain food principles, possibly peptones, produced by the yeast which are not changed by heating. . . .

"The influence of the filtrate upon the virility of the lactic bacterium increases directly as the amount of filtrated inoculum is increased; this is true in the heated as well as in the unheated filtrate. The filtrate both heated and unheated has a marked stimulating effect both upon the virility and upon the acid production of weak lactic bacteria, which results in the rapid dying-out of the lactic bacteria in the cultures to which the yeast filtrate has been added. [In all probability] this effect may be attributed to the fact that the organisms have been induced to produce nearly double their usual amount of acid, and as a consequence have become hypersusceptible to their own products. . . . It follows then that a weak lactic bacterium will live much longer in pure culture in milk if no stimulant is added or if acid formation is prevented. [The figures for] the hourly fermenting capacities of the weak lactic bacteria show that the presence of the yeast filtrate, of the pepsin, or of the rennin solution causes an increase of the fermenting power to nearly double that of the check. . . .

"The fact that the red yeast is a strict aerobe and lactic bacteria are facultative, preferably anaerobes, accounts in all probability for one phase of the beneficial associative action. It was proved quite conclusively that acid introduced artificially or produced naturally in milk or whey is destroyed by the yeasts, not merely neutralized.

"After sojourning for some time with the different yeasts, the several lactic bacteria were isolated and tested to ascertain whether the flavor of the curd had been changed. These cultures were compared with the original pure culture, and no change had been effected. It is noteworthy that the mixed cultures which have become contaminated with molds or other bacteria and yeasts have not lost their power of retaining the vitality of the lactics except in one instance. Foreign organisms seem to have no appreciable effect on the lactic bacterium and the yeast after the symbiosis of the latter had once been established.

"In the case of the mixed culture of the red yeast with different lactic bacteria, the lactic bacterium, even a very weak organism, has a chance to produce its maximum amount of acid before any appreciable acid destruction can take place. The high acid-producing organism used in the test, unlike *B. bulgaricum* and ordinary lactic bacteria, survives a long sojourn at its maximum acidity (in the neighborhood of $+280^{\circ}$). The red yeast grows most difficultly with this lactic organism. . . .

"Many of the above statements are corroborative in their kind, of the conclusions drawn in Bacterial Associations in the Souring of Milk by Marshall and Farrand [E. S. R., 20, p. 275] concerning the associative action of other bacteria with lactic organisms. This phenomenon of associative action in time may solve the problem of keeping other short-lived organisms almost indefinitely without frequent transfers.

"Further studies are being undertaken dealing with other phases of this interesting problem." A bibliography is appended.

Composition and properties of some casein and paracasein compounds, and their relations to cheese, L. L. VAN SLYKE and A. W. BOSWORTH (*New York State Sta. Tech. Bul.* 26, pp. 3-32).—This work was undertaken with a view of obtaining information regarding preparation and properties of the com-

pounds formed by casein and paracasein with bases, especially with calcium, and particularly to determine whether there were other compounds containing less calcium than the compounds previously prepared by the authors (E. S. R., 16, p. 1018), and to ascertain the composition of the substances formed in cheese which are soluble in 5 per cent sodium chlorid solution (E. S. R., 26, p. 212).

It is pointed out that for investigations of this sort casein must be made base-free. "Preparations were made containing less than 0.1 per cent of ash. The usual method was employed in part, precipitating separator skim milk with dilute acetic acid, redissolving the washed precipitate in dilute NH_4OH , and continuing precipitation and solution 3 or more times. Finally, the remaining calcium is precipitated from the ammonia solution as oxalate, the precipitate being removed by centrifuging and filtering, and the filtrate precipitated with dilute HCl . After washing free from HCl , the casein is treated with alcohol and ether, and after grinding and partial drying is dried over H_2SO_4 under reduced pressure. Analysis of such casein preparations agrees with the composition generally accepted, except in the amount of phosphorus and sulphur."

Basic calcium caseinate "was prepared in two ways, (1) by decomposing CaCO_3 with casein, and (2) by treating casein with a lime water solution and neutralizing the excess with HCl with phenolphthalein as indicator. The composition of the resulting compound was determined (1) by weighing the CO_2 expelled from CaCO_3 , (2) by determining the Ca in the resulting casein compound, and (3) by analysis of the compound formed by treating lime water solution of casein with acid until neutral to phenolphthalein. The different results agree closely, showing basic calcium caseinate to contain about 1.78 per cent Ca (2.5 CaO), or 1 gm. of casein combines with 9×10^{-4} gm. equivalents of Ca."

To prepare acid or unsaturated caseinates of ammonium, sodium, and potassium, "ash-free casein is dissolved in alkali so that 50 cc. of fiftieth-normal alkali contain 1 gm. of casein. This is neutralized with fiftieth-normal HCl , which is added in small portions, under constant agitation, until a permanent precipitate begins to appear, as shown by centrifuging a portion of the mixture in a sedimentation tube. This method enables one to detect the casein precipitated by 0.2 cc. of fiftieth-normal HCl . The point at which a permanent precipitate first begins to appear is noted, and addition of acid is continued until all the casein is precipitated, which point is also noted. Three different casein preparations were used and numerous determinations were made. It was found that 1 gm. of casein forms a soluble compound with each of the alkalis used when combined with amounts somewhere between 1.1×10^{-4} and 1.15×10^{-4} gm. equivalents of alkali; or, 1 cc. of tenth-normal alkali combines with an amount of casein somewhere between 0.87 and 0.91 gm. The proportion of basic element in each compound is as follows: NH_4 , 0.2 per cent; Na, 0.26 per cent; and K, 0.44 per cent. Such casein compounds contain the smallest known amount of base, and it is suggested that they be called monobasic caseinates."

In preparing acid or unsaturated caseinates of calcium, strontium, and barium 1 gm. of ash-free casein is dissolved in 250 cc. of fiftieth-normal hydroxid solution, and fiftieth-normal HCl is added until the first sign of a permanent precipitate appears, as shown by centrifuging a portion. The solution is then dialyzed to remove soluble chlorid, and then acid is again added until precipitation again occurs and another dialysis is made. Alternate addition of acid and dialysis are continued until finally the dialyzed solution forms a permanent precipitate with the addition of any acid. The results of many experiments agree in indicating the formation of two sets of compounds,

monobasic and dibasic, one set containing twice as much base as the other. In the dibasic compounds, 1 gm. of casein requires between 2.2×10^{-4} and 2.3×10^{-4} gm. equivalents of hydroxid to form a compound soluble in water but easily precipitable by even a small amount of a soluble chlorid of calcium, strontium, or barium. In the dibasic compounds, 1 gm. of casein combines (a) with 0.44 to 0.46 gm. Ca, (b) with 0.96 to 1.01 gm. Sr, and (c) with 1.51 to 1.58 gm. Ba. In the monobasic salts, 1 gm. of casein combines with about 1.1×10^{-4} gm. equivalents of hydroxids to form insoluble compounds, which are soluble in 5 per cent solution of chlorid of sodium, ammonium, or potassium. This solubility is due to an exchange of bases; for example, insoluble monocalcium caseinate is changed by treatment with solution of NaCl into soluble monosodium caseinate and CaCa₂, as shown by special experiments.

Special preparations were made of monoammonium caseinate and of mono and dicalcium caseinates, each compound being isolated and prepared in dry form. These were found to have essentially the composition called for by the previous results obtained with the volumetric work.

"On the basis of the composition of the basic calcium caseinate and monocalcium caseinate, the former has a valency of 8. These relations indicate the molecular weight of casein to be 8888, and the equivalent weight 1111."

For preparing paracasein, "separator skim milk is heated to 37° C. and treated with 0.12 cc. of rennet-extract (Hansen's) per 1,000 cc. of milk. The milk is allowed to stand until completely precipitated. The resulting curd is broken up by vigorous stirring, the whey removed, and the precipitated paracasein washed freely with water. It is then dissolved in dilute NH_4OH , reprecipitated with acid, and the operation continued and completed as in the case of casein."

By the same methods of study, paracasein was shown to form with calcium a paracaseinate similar in composition and properties to that of basic calcium caseinate. In acid or unsaturated paracaseinates of ammonium, sodium, and potassium, 1 gm. of paracasein combines with just double the alkali in the corresponding casein compounds, and forms soluble compounds which are acid to both litmus and phenolphthalein. A preparation of monoammonium paracaseinate in dry form gave results agreeing fairly well in composition with the results obtained by volumetric work.

Mono- and dibasic paracaseinates of calcium, strontium, and barium were prepared in the same manner as the corresponding caseinates, and were shown to differ from them in having just twice as much of the basic element. Their properties resemble those of the corresponding caseinates.

"The valency and molecular weight of paracasein are shown to be one-half those of casein. When casein is treated with rennet-enzym, the casein molecule appears to be split into 2 molecules of paracasein.

"During the manufacture and ripening of Cheddar and many other kinds of cheese, a protein is always formed which is insoluble in water but soluble in a 5 per cent solution of NaCl. Former studies led to erroneous conclusions regarding its identity. Extended study shows that this substance is identical with monocalcium paracaseinate." [E. S. R., 14, p. 607; 19, p. 176; 21, p. 177.]

The quantitative separation and determination of subsidiary dyes in the permitted food colors, W. E. MATHEWSON (*U. S. Dept. Agr., Bur. Chem. Circ. 113, pp. 4*).—Most simple commercial dyestuffs are often found to contain large amounts of subsidiary coloring matters, and the amount of these present is of some importance because they may be the most objectionable of the impurities. As reasonably pure coloring matters are necessary when examining methods for the estimation of subsidiary colors, some colors were prepared in the laboratory and others were obtained in commerce. The dyes considered, which were

Orange I, Orange II, Ponceau 3 R, Crocein Orange, Amaranth, Fast Red E, and New Coccin. were given a second crystallization, or salting out, and seemed practically free from organic impurities.

The methods described are for the determination of Fast Red E and similar colors in Amaranth (E. S. R., 26, p. 506), approximate determination of New Coccin and similar dyes in Amaranth, determination of monosulphonated dyes in Ponceau 3 R, and determination of Orange II in Orange I. "Determined by these methods in the dyes intended for sale as food colors, Amaranth contains from 1 to 5 per cent lower sulphonated colors, and somewhat more New Coccin and similar dyes. Ponceau 3 R contains from 1 to 5 per cent lower sulphonated dyes, and Orange I the same amount of Orange II."

The identification of small amounts of dyestuffs by oxidation with bromin, W. E. MATHEWSON (*U. S. Dept. Agr., Bur. Chem. Circ. 114, pp. 3*).—"The test to aid in identifying small amounts of coloring matters, which is described in this paper, has been in use in the New York laboratory [of the Bureau of Chemistry] for some time. It is simple, in many cases very sensitive, and seems to require no special care to obtain reasonably dependable results.

"A few cubic centimeters of the dye solution are treated with bromin water, added drop by drop until about twice as much has been used as is required to destroy the color. Some hydrazin sulphate solution is then added to take up the excess of bromin, and finally an excess of sodium carbonate. A second test portion is treated in exactly the same way, except that a few drops of a-naphthol solution (10 per cent in 50 per cent alcohol) are added just before making alkaline with the carbonate."

The dyes studied in connection with this test were Naphthol Yellow S, Tartrazin, New Coccin, Amaranth, Fast Red C, New Red L, Light Green S F Yellowish, Erythrosin, Rhodamin B, Alizarin Red S, Safranin, Azocarmin G, Quinolin Yellow, Fustic, Saffron, and Cochineal.

"In general it may be said that if in testing unknown solutions the dye is bleached by bromin and restored by hydrazin, or if the coloration with a-naphthol and sodium carbonate is different from that with sodium carbonate alone, a coal-tar color is present."

Sampling cane for chemical analysis, J. T. CRAWLEY (*Porto Rico Sugar Growers' Sta. Rpt. 1912, pp. 13, 14*).—"In securing samples of cane for analysis, it is practically impossible to obtain those which will be representative of the whole field or plat. In addition to this, when using a small laboratory mill for grinding the cane, the extraction is not as complete as it would be on a large scale, and, furthermore, there is a notable difference between the composition of the juice expressed and that left in the cane. In order to get accurate data along these lines comparisons were made with the juice obtained by the laboratory mill and from a large sugar mill.

"There is comparatively little difference in the sucrose and purity of the canes from the different plats according to the factory sample, whereas there is a great difference between the different plats according to the laboratory mill samples. . . . Great differences as to the sucrose and purity would have been indicated where, as a matter of fact, such differences did not exist.

"As additional data along this line 4 samples were taken from each of 2 plats, passed through the hand mill, and the juice analyzed. . . . In the first set of samples there was a variation of 6.2 per cent sucrose and 14.5 points in purity, and a variation of 2.3 per cent sucrose and 6 points purity in the second set. In view of these results we must look with suspicion on any general deductions made from results secured by passing small samples of cane through a hand mill."

Some effects of refrigeration on sulphured and unsulphured hops, W. W. STOCKBERGER and F. RABAK (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 271, pp. 21*).—The purpose of this work was to determine the effect of refrigeration on the quality of sulphured and unsulphured hops grown on the same field in the Sacramento Valley, Cal. The green hops were divided into 2 lots, one of which was sulphured during the process of drying. Bales from each lot were placed in cold and in ordinary storage, and samples examined from time to time with respect to physical condition and certain chemical constituents.

At intervals of 7 and 18 months, respectively, from the time the hops were placed in storage, samples were drawn and submitted to trade experts for rating according to their relative quality.

The results show that both cold storage and sulphuring delayed undesirable chemical changes and, furthermore, that the usual trade judgment can not be relied upon to give an accurate idea of the changes which have occurred in such goods, as opinions vary widely on the same sample. All of the experts agreed, however, that the sulphured hops in cold storage were the best in quality.

During the storage period determinations of the acid, ester, and resin contents were made. The conclusions drawn from these analyses are that both sulphuring and cold storage retard changes in the hops leading to an increase in acidity and ester content of the oils. Cold storage is apparently more effective than sulphuring in retarding the increase in acidity, but is less efficient than sulphuring in retarding increase in ester content. Cold storage and sulphuring combined are much more effective in retarding changes in acidity and ester content than either alone.

"The percentage of decrease in the content of soft resins was less in the cold-stored hops than in those in ordinary storage. The evidence from the analyses goes to show that the sulphuring tends to retard changes in the content of soft resins only when combined with cold storage."

The utilization of waste raisin seeds, F. RABAK (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 276, pp. 36, figs. 3*).—This investigation deals with the utilization of this by-product hitherto disregarded, from the raisin-seeding and wine and grape juice industries.

It is shown that 4 commodities, sirup, fixed oil, tannin extract, and meal can be made from grape and raisin seeds, of which from 3,000 to 4,000 tons are available annually. The sirup produced from the saccharin matter which adheres to the seeds was clear and transparent, and had the characteristic, pleasant taste of the raisin. It had a specific gravity of 1.384 at 22° C., contained 61 per cent of reducing sugars calculated as dextrose, and 2.94 per cent of saccharose. The acidity of the sirup corresponded to 1.06 per cent of tartaric acid. Approximately 18.5 per cent of sirup is obtainable, or from 96,000 to 128,000 gal. of sirup. If fermented this amount of sirup would yield approximately from 41,000 to 54,000 gal. of alcohol (*U. S. Pharmacopœia*).

The fixed oil, which is extracted after removing the sugary pulp and screening and drying the seeds, is pale, golden-yellow in color, has a slight fatty odor, and a bland, nut-like taste. The specific gravity of the oil obtained by extracting with ether is 0.922, at 24°, and it has a refractive index of 1.4702 at 25°. The yield was 14.5 per cent of the dried seeds. The saponification value was 188, the iodine number (Hübl's) 131, the volatile acids (Reichert-Meissl figure) 0.64, acids soluble in water 0.394 per cent, insoluble acids 94.4 per cent, acetyl value 16, and unsaponifiable matter 0.78 per cent.

A detailed chemical examination of the oil showed it to be composed of linolein 54 per cent, olein 34.48, palmitin 7.87, stearin 0.94, and free acids (calculated as oleic acid) 0.62 per cent. As the fixed oil contains constituents

with drying properties, comparative tests with linseed oil were made. Both oils were heated and treated with lead oxid and heat, and with manganese dioxid and heat. Some tests with raw oil were also made.

The raw oils absorbed oxygen slowly, and the percentage increase was a little greater in the case of linseed oil. Both films of oil were dry but gelatinous, the raisin oil being a trifle more sticky. The heated oils absorbed oxygen much more quickly than the raw oils. "The increase was steady and considerably more rapid than in the raw oils, the maximum in both oils being reached in 216 hours. The percentage of absorption was practically the same as in the raw oils, but the time of absorption was less in the raisin-seed oil, the heating, therefore, having the effect of hastening the drying.

"The experiments show also that by heating the oils with lead oxid in quantities varying from 0.5 to 4 per cent, oxygen was absorbed with much greater rapidity than by the heated or raw oils. When heated with 1 and 2 per cent of lead oxid, the films had practically become set in 6 hours, the absorption in raisin-seed oil amounting to 5.1 and 5.7 per cent, respectively, and in linseed oil to 7.8 and 9.3 per cent, respectively. . . . The maximum absorption in the case of raisin-seed oil was 8.1 to 9.12 per cent, and in linseed oil 12.2 to 13.7 per cent, which was about the same range. . . . Manganese dioxid seemed to be much less efficient as a drier than the lead oxid, the length of time necessary to dry the films being in all cases considerably longer than when the oils were heated with lead oxid. . . . Taking into consideration the ready-drying property of raisin-seed oil, especially when treated with an ordinary drier such as lead oxid, it should be of value in the paint and varnish industries." The experiments bear this out. "Raisin-seed oil is decidedly resistant to heat and declines to take on color even when heated to 500° F., whereas linseed oil darkens considerably and takes on a greenish color. The somewhat slower drying properties of raisin-seed oil should not be especially detrimental to its usefulness, since this can doubtless be overcome by treatment of the raw oil with proper driers."

The tests conducted also show that the oil may eventually find a place in the soap industry.

"After the preparation of the sirup and the extraction of the oil from the seeds, the extraction of tannin has been recommended. The production of tannin extract is practicable only in the case of raisin seeds, since wine residues are probably largely depleted of their tannin content. The tannin, being soluble in water, can be extracted in a practical way by boiling the meal in large digestion vats, the solution being transferred to vacuum pans for concentration to a moist extract. If a dry extract is preferred it can be obtained by simply allowing the moist extract to dry in the air. The large quantity of tanning extract which can be produced from raisin-seed meal, and which is well adapted for the tanning of leather, becomes the third important commercial product capable of being made from raisin seeds."

The final residue, termed the meal, gave on analysis 10.6 per cent of moisture, 12.12 per cent of protein, 1.2 per cent of ether extract, 30.5 per cent of nitrogen-free extract, 43.2 per cent of crude fiber, and 2.4 per cent of ash. On account of its comparatively high protein content, it is suggested that it should be useful as a stock feed.

METEOROLOGY—WATER.

A method of approximating rainfall over long periods and some results of its application, A. E. DOUGLASS (*Science, n. ser., 37 (1913), No. 940, p. 33*).—"It was found by a test extending over 43 years that the radial thickness of the rings of the yellow pine of northern Arizona gives a measure of the rain-

fall in that vicinity with an average accuracy of over 70 per cent. By applying a simple formula, taking into account the conservation of moisture, the accuracy may be increased to about 75 per cent. By cross identification of rings between all the hundred trees examined, the accuracy of counting rings was greatly increased.

"Five trees from the vicinity of Flagstaff were measured to the number of 400 rings, and two of these to 500. It was found that all the trees in that locality gave very similar records. A 21-year variation, amounting in all to 20 per cent of the mean, is shown in 400 out of the 500 years recorded. A shorter variation, amounting to 16 per cent of the mean, was found to have a period of 11.4 years. Its plot derived from 492 years shows 2 maxima, which correspond in time with 2 maxima of rainfall in the 50 years of records on the southern California coast. These in turn match the major and minor maxima in the temperature of that region for the same period. The larger maximum of the latter occurs at the time of the sun-spot minimum as averaged for 125 years."

Weather conditions and statistics, G. HARCOURT (*Ann. Rpt. Dept. Agr. Alberta, 1911, pp. 38-52*).—The names and location of the stations of the voluntary meteorological service of the Province of Alberta are given, with results of observations on precipitation (1898-1911), and on temperature and sunshine (1911). Notes are also given on the general weather conditions of each month of 1911 and on hail insurance during the year.

Phenology and climatology in the service of fruit culture and agriculture, L. JOCHIMSEN (*Landw. Jahrb. Bayern, 2 (1912), No. 2, pp. 113-120*).—This is a general discussion of the subject.

The movement of subterranean waters, J. VERSLUYS, trans. by F. DASSESSE (*Le Principe du Mouvement des Eaux Souterraines. Amsterdam, 1912, pp. 147; rev. in Nature [London], 91 (1913), No. 2267, p. 134*).—This book deals with the subject in the light of recent research, as exemplified by the work of King, Richert, and others. It discusses the purely theoretical problem of water flow, but also furnishes a series of numerical coefficients of flow for use in cases where merely general approximations will serve.

Text-book of ground water and springs, K. KEILHACK (*Lehrbuch der Grundwasser- und Quellenkunde. Berlin, 1912, pp. XI+545, pl. 1, figs. 249; rev. in Wasser u. Abwasser, 6 (1913), No. 9, pp. 365, 366*).—This book summarizes the results of 25 years' study by the author of conditions in northern and central Germany. It deals with geological, chemical, and physical principles involved in the occurrence and movement of ground water, but also contains much practical information regarding the utilization of these sources of water supply and is adapted to the use of geologists, hydrologists, waterworks' engineers, and hygienists.

Geology and water resources of a portion of south-central Washington, G. A. WARING (*U. S. Geol. Survey, Water-Supply Paper 316, pp. 46, pl. 1, fig. 1*).—This paper discusses in some detail the geography, physiography, geology, and water resources of this region, which comprises about 5,000 square miles, and includes Benton County, the eastern parts of Yakima and Klickitat counties, and the western part of Franklin County. The report presents the results of "a hurried inquiry into the present utilization of surface and underground water by canals and by wells and a general study of rock characters and structural conditions in their relation to further development of the underground sources. . . . Except in the bottoms near the major streams, water is scarce, even for domestic use."

The water supply is discussed from the standpoint of its use for irrigation as well as for domestic purposes.

Our artesian waters, R. S. SYMMONDS (*Sydney, N. S. Wales, 1912, pp. 81, pls. 16, figs. 35*).—This monograph summarizes observations in the laboratory and the field on the geological origin, composition, and agricultural value of the artesian waters of Australia.

The theory is advanced as a result of these observations that the decrease in flow of some of the artesian wells is due to leakage and corrosion of the casing and not to a reduction of the subterranean supply. Facts are presented which are thought to support the theory of a plutonic (magmatic) origin of artesian water. Experiments are reported which indicate the possibility of the economical neutralization of waters containing small amounts of alkaline carbonate "by the direct application of electro-chemical nitric acid which could be made from the atmosphere by utilizing the power derivable from the pressure given by the outflow of water."

Rain as a drinking water supply in British Guiana, K. S. WISE and E. P. MINETT (*Jour. London School Trop. Med., 2 (1912), No. 1, pp. 74-88*).—A somewhat detailed examination of the cistern waters which are the main supply for drinking purposes in that country and of the nature and sources of their contamination is reported. The condition of the waters was found to be very bad, and sterilization by means of chlorinated lime is recommended.

The experience of the State of Indiana with the shallow well (*Engin. and Contract., 39 (1913), No. 14, p. 394*).—This article reviews briefly the work of H. E. Barnard, chemist of the Indiana State Board of Health, on the character of the shallow well waters of that State. The results of examinations of 5,000 samples of such waters showed that in more than 50 per cent of all cases the water was polluted.

SOILS—FERTILIZERS.

Field operations of the Bureau of Soils, 1910 (twelfth report), M. WHITNEY ET AL. (*U. S. Dept. Agr., Field Operations of the Bureau of Soils, 1910, pp. 1772, pls. 31, figs. 52, maps 43*).—This report contains a general review of the field operations of the Bureau of Soils during 1910 by the chief of the Bureau, together with detailed accounts of the following surveys:

Monroe County, N. Y., by G. A. Crabb, M. E. Carr, B. D. Gilbert, and G. J. Bouyoucos; Ontario County, N. Y., by M. E. Carr, O. Lee, jr., G. B. Maynadier, V. J. Frost, and D. J. Hallock; Erie County, Pa., by G. B. Maynadier and F. S. Bucher; a reconnaissance soil survey of south-central Pennsylvania, by C. F. Shaw, W. C. Byers, and W. G. Ross; Washington County, Pa., by F. S. Welsh, F. S. Bucher, and D. K. Sloan; Cabarrus County, N. C., by R. T. Allen, E. W. Thornton, and H. Hill; Granville County, N. C., by R. B. Hardison and D. D. Long; Mecklenburg County, N. C., by W. E. Hearn and L. L. Brinkley; Clarendon County, S. C., and Walker County, Ga., by W. E. McLendon; Bulloch County, Ga., by C. N. Mooney, R. B. Hardison, D. D. Long, and W. C. Byers; Sumter County, Ga., by J. C. Britton and F. S. Welsh; Jacksonville area, Fla., by G. B. Jones and J. E. Ferguson; Dale County, Ala., by L. A. Hurst, R. W. Rowe, and A. D. Cameron; Pike County, Ala., by W. E. Tharp, W. L. Lett, and W. E. Wilkinson; Adams County, Miss., by W. J. Geib and A. L. Goodman; Lauderdale County, Miss., by H. H. Bennett, H. C. Smith, W. M. Spann, E. M. Jones, and A. L. Goodman; Noxubee County, Miss., by H. C. Smith, W. J. Geib, A. L. Goodman, E. M. Jones, and W. M. Spann; Concordia Parish, La., by C. J. Mann, E. B. Watson, P. O. Wood, and R. T. Allen; reconnaissance soil surveys of the central Gulf coast area and the Panhandle region of Texas, by W. T. Carter, jr., et al.; Ellis County, Tex., by F. Bennett, R. T. A. Burke, and C. Lounsbury; Rockcastle County, Ky., by R. T. A. Burke, F. Bennett, and C.

Lounsbury; Clarksburg area, W. Va., by C. N. Mooney and W. J. Latimer; Point Pleasant area, W. Va., by W. J. Latimer and C. N. Mooney; Bayfield area, Wis., by G. B. Maynardier, W. J. Geib, L. Schoenmann, and F. L. Musback; Iowa County, Wis., by C. Lounsbury, T. J. Dunnewald, and E. Truog; Waukesha County, Wis., by W. J. Geib, P. O. Wood, G. B. Jones, and A. H. Meyer; Cape Girardeau County, Mo., by H. Krusekopf and H. G. Lewis; Jackson County, Mo., by A. T. Sweet, H. Krusekopf, and J. E. Dunn; Marion County, Mo., by J. C. Britton and E. S. Vanatta; Pemiscot County, Mo., by A. T. Sweet, C. J. Mann, H. Krusekopf, E. S. Vanatta, and H. G. Lewis; reconnaissance soil survey of western Kansas, by G. N. Coffey, T. D. Rice, et al.; Uncompahgre Valley area, Colo., by J. W. Nelson and L. A. Kolbe; reconnaissance soil survey of the western part of the Puget Sound Basin, Wash., by A. W. Mangum et al.; Red Bluff area, Cal., by L. C. Holmes and E. C. Eckmann; Livermore area, Cal., by H. L. Westover and C. Van Duyne; Madera area, Cal., by A. T. Strahorn, H. L. Westover, L. C. Holmes, E. C. Eckmann, J. W. Nelson, and C. Van Duyne.

During the calendar year 1910, 18,528 square miles, or 11,857,920 acres, were surveyed and mapped in detail on a scale of 1 in. to the mile, making the total area surveyed and mapped up to the end of that year 214,503 square miles, or 137,281,920 acres.

In addition to the detailed surveys, there were conducted in 1910 reconnaissance surveys in Pennsylvania, Texas, Kansas, and Washington, covering a total area of 81,624 square miles, or 52,239,360 acres.

[Porto Rico soils], F. W. ZERBAN (*Porto Rico Sugar Producers' Sta. Rpt. 1912, pp. 29-35*).—A brief summary is given of studies of the physical and chemical characteristics of the more common cane, salt marsh, and alkali soils of Porto Rico.

The fertile alluvial cane soils of the north coast, which have been under cultivation for 300 years and still give notable returns, vary from sandy to clayey loams containing from 1.07 to 2.56, with an average of 1.59, per cent of lime; 1.68 to 2.05, with an average of 1.92, per cent of magnesia; 0.3 to 0.42, with an average of 0.36, per cent of potash; 0.15 to 0.18, with an average of 0.17, per cent of phosphoric acid; and 0.18 to 0.63, with an average of 0.31, per cent of nitrogen. The cane soils of the northeast and east of the island are stiff clays of little depth and poorer in fertilizing constituents than the north coast soils, containing only half the amount of phosphoric acid and two-thirds the amount of nitrogen. Potash, lime, and magnesia are also lower than in the north coast soils. The west coast soils vary from sandy loam to clay loam and are still poorer in plant food than the northeast and east soils. The south coast soils are generally deep and of good mechanical condition. They are also generally rich in lime, magnesia, and potash, contain a fair percentage of nitrogen, but are rather low in phosphoric acid. With the possible exception of phosphoric acid, all of the cane soils examined probably contain sufficient plant food for productive crops.

There are found, especially along the north coast, considerable areas of salt marsh soils which have been partly drained. These soils consist principally of an upper layer, largely composed of organic matter, underlain by limestone. The surface material contains only from 10 to 15 per cent of mineral matter, of which from 3 to 6 per cent is lime. It contains 2 per cent of nitrogen, about 0.05 per cent of phosphoric acid, and from 0.1 to 0.2 per cent of potash. The drainage waters from these lands contain large amounts of soluble salts, especially sodium chlorid. On the dry south side of the island are found stretches of land which are unproductive as a result of the presence of excessive amounts of soluble salts (alkali). These soluble salts usually consist of mixtures of

chlorids, sulphates, bicarbonates, and carbonates of sodium, potassium, calcium, and magnesium in varying proportions.

The nature of the dry farm soils of Utah, J. A. WIDTSOE and R. STEWART (*Utah Sta. Bul. 122, pp. 271-288*).—Studies of the origin, physical properties, and chemical composition of the soils of the dry farms in Juab, San Juan, Sevier, Iron, Tooele, and Washington counties are reported and discussed.

"A study of the results reported . . . clearly indicates that the soil fertility problem on the dry farms is clearly one of the addition of organic matter containing nitrogen to the soil for the purpose of liberation of the plant food. With the exception of the San Juan County section, there is no possibility of the soil becoming acid in nature. The soils are all abundantly supplied with sufficient potassium for wheat production, which will undoubtedly be the chief crop produced on the dry farms. The soils are well supplied with phosphorus and it is not probable that the addition of this element would be profitable in the immediate future. Further investigation should be carried on regarding the nitrogen and humus content of our dry farm soils. And in the meantime every occasion should be taken to plow under the stubble and to make better utilization of the straw stacks on the farm."

The soil of the Southern Utah Experiment Station, J. A. WIDTSOE and R. STEWART (*Utah Sta. Bul. 121, pp. 243-268, fig. 1*).—This soil is very sandy in nature and contains crystallized gypsum. The average composition of the first and third foot of the soil is given in the following table:

Average composition of the soil, Southern Utah Experimental Farm.

Soil constituent.	Surface foot. (Average of 15 analyses.)	Third foot. (Average of 8 analyses.)
	<i>Per cent.</i>	<i>Per cent.</i>
Insoluble residue.....	77.93	77.60
Potash, K ₂ O.....	.58	.49
Soda, Na ₂ O.....	.36	.15
Lime, CaO.....	5.37	5.20
Magnesia, MgO.....	2.54	2.57
Sulphuric acid, SO ₃	1.01	1.44
Iron oxide, Fe ₂ O ₃	2.36	2.22
Alumina, Al ₂ O ₃	3.45	2.34
Phosphoric acid, P ₂ O ₅.....	.17	.17
Carbon dioxide, CO ₂	4.49	3.48
Difference.....	1.74	4.34
Total.....	100.00	100.00
Humus.....	0.580	0.4900
Nitrogen.....	.029	.0214

These results show that the soil contains a normal amount of potash, but a low amount of phosphoric acid, and is extremely deficient in humus and nitrogen, the latter being the limiting element of plant production. The soil contains a good supply of the other essential elements of plant food and is well supplied with calcium carbonate. It contains a high percentage of magnesia. It also contains small amounts of sodium chlorid, sulphate, and carbonate. Although the percentage of water-soluble salts is high, four-fifths of this "alkali" is gypsum. The needs and management of the soil are discussed.

Two volcanic loams of Japan, T. SEKI (*Landw. Vers. Stat., 79-80 (1913), pp. 871-890*).—Studies of the mineralogical composition, particularly as regards the presence and composition of zeolitic compounds, of the volcanic loam formations of Tokio and of Morioka, Japan, indicated that allophane-like compounds were present in the Tokio loam, probably a decomposition product of plagioclase. The principal decomposition product of the soil was an argillite-like substance, composed mainly of colloidal material and iron oxid.

The clay substance of the Morioka loam was composed of (1) allophane-like aluminum silicate, which formed most of the argillite-like material; (2) kaolin-like aluminum silicate, which formed most of the argillite mixture; and (3) an anauxite-like aluminum silicate, which formed a large proportion of the clay aggregate not decomposed in sulphuric acid.

The mineralogical analysis of soils, W. H. FRY (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 1, pp. 30-32).—A fuller discussion of this subject has been noted in Bulletin 91 of the Bureau of Soils (E. S. R., 28, p. 812).

Soil and crop and their relation to state building, A. N. HUME (*South Dakota Sta. Bul.* 139, pp. 3-16).—This bulletin does not report experimental work, but presents an argument in favor of a state-wide study of soil and crop conditions.

The action of the soil on substances in suspension and in solution, A. PETIT (*Rev. Hort. [Paris]*, 85 (1913), No. 4, pp. 86, 87).—This is a somewhat general discussion of this subject and summarizes briefly some of the more recent investigations on the subject.

The effect of mixing with a lighter soil moor soil, marl, clay, and straw, GERLACH (*Landw. Vers. Stat.*, 79-80 (1913), pp. 681-699).—Preliminary tests of the effect of applications of lowland moor soil, marl (61.4 per cent of CaCO_3), clay, and straw on the yield of potatoes, barley, peas, wheat, and sugar beets on a loamy sand, low in humus, with and without the addition of a basal fertilizer, are reported.

The results in general showed a marked increase in yield of the various crops from applications of the different materials, but their effect was much reduced when they were used in combination with a basal fertilizer.

Improvement of an agricultural soil near Rome, G. DE ANGELIS D'OSSAT (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat e Nat.*, 5. ser., 22 (1913), I, No. 4, pp. 246-252).—The physical properties of the soil as affected by marling were studied.

The action of soils containing graphite on germinating and growing plants, F. KARYŽ (*Ztschr. Pflanzenkrankh.*, 23 (1913), No. 2, pp. 72-81, fig. 1).—Pot experiments with soils containing varying amounts of graphite, up to 80 per cent, showed that more than 50 per cent of graphite interfered to some extent with germination and growth. Transpiration was also increased by the presence of graphite in the soil, but the assimilation of plant food was not appreciably affected. It appears therefore that, while graphite does not play an entirely indifferent rôle in the soil, it is in no sense poisonous and injures only those plants which are very sensitive to increased transpiration.

Soil temperature in its relation to plant growth, W. NAEGLER (*Mitt. Justus Perthes' Geogr. Anst.*, 58 (1912), Nov., pp. 253-257, fig. 1; *Umschau*, 17 (1913), No. 10, pp. 192, 193; *abs. in Met. Ztschr.*, 30 (1913), No. 1, p. 42).—This article reviews investigations on this subject, discussing particularly soil temperature as a plant biological and geographical factor, the relation of soil temperature to phenological phenomena, the influence of geographical position and sea level upon vegetation and soil temperature, and the relation of the coming of spring to a temperature of 10° C. in the soil and the duration of sunshine.

The author concludes that there is a direct relation between soil temperature and the coming of spring. A deficiency of 1° C. in the average soil temperature at depths of from $\frac{1}{2}$ to 1 meter in March and April delays spring 10 days. The blooming of apples coincides closely with the appearance of a temperature of 10° in the soil at a depth of $\frac{1}{2}$ meter. A decrease in the average daily duration of sunshine of 1 hour during the winter lowers the temperature of the soil during March and April 3° and delays spring 1 month.

The bacterial activity in soil as a function of grain size and moisture content, O. RAHN (*Michigan Sta. Tech. Bul. 16, pp. 3-41, fig. 1*).—The bulletin records results of extensive experiments covering the ammonia formation by *Bacillus mycoides* in five different soils, three different sands, in solutions and soil extracts; a more detailed study of the mechanism of the ammonia production, and experiments with other aerobic bacteria; and on the requirements of anaerobic organisms.

The author concludes that "for the comparison of bacterial efficiency in soil, and for the study of the influence of soil upon micro-organisms, it is necessary to use equal volumes of soil solution as the basis of comparison.

"The amount of oxygen that diffuses into a solution under ordinary laboratory conditions, i. e., in a test tube or flask, is by no means sufficient to allow maximum growth of aerobic bacteria. The experiments with *B. mycoides*, *Bacterium aceti*, and *Azotobacter* show that the development increases with decreasing thickness of the layer of moisture, the maximum being reached at a thickness of from 10 to 20 microns. Experiments concerning the oxygen requirements and oxygen tolerance of bacteria should be carried on with very thin liquid films, as they are found in a coarse sand with 5 to 10 per cent moisture.

"If the moisture film becomes less than 10 microns in thickness, the development of bacteria is retarded because, though the oxygen supply is abundant, the diffusion of food to the cells and the diffusion of metabolic products from the cells is not sufficient to allow the fastest metabolism. In this case the growth will be slower, but the end point of decomposition will be the same if the moisture film is thick enough to permit a complete though slow exchange of food and products through the whole soil solution. The rate of decomposition in such soils depends consequently upon the number of cells and their even distribution. If the film becomes very thin the diffusion ceases almost completely and the cells may die from starvation.

"Aeration and thickness of the moisture film are the two controlling factors in quartz sand cultures. They may be considered as the main physical factors of the soil. They depend both upon the average grain size and the moisture content.

"Aeration increases with the square of the grain size, while the moisture film increases in direct proportion to the grain size. A coarse soil is, therefore, of advantage to aerobic bacteria. Aeration decreases with increasing moisture, and the moisture film increases, consequently moisture is desirable only to a limited degree, namely, until the surface film reaches the optimum thickness.

"The grain size of the cultivated soils is so small that the optimum moisture film is reached only in the water-logged state. Such soils will never reach the maximum rate of decomposition, because the ideal conditions of maximum aeration and optimum moisture film can not be fulfilled at the same time. The rate of decomposition is necessarily slow, but the final endpoint of decomposition may be the same as in coarse-grained soils.

"Anaerobic bacteria are favored by increasing moisture, since it increases the film diameter and decreases aeration. They are also favored by a large grain size. The grain size of soils may be so small that even saturation with water does not afford optimum conditions for anaerobic bacteria on account of too slow diffusion.

"Absorption plays a minor rôle in the bacterial activity of quartz sand cultures."

The bacterial activity in the soil as a function of the size of the soil particles and water content, O. RAHN (*Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 17-19, pp. 429-465, fig. 1; abs. in Chem. Zentbl., 1912, II, No. 26, pp. 2133,*

2134; *Chem. Abs.*, 7 (1913), No. 3, p. 527).—Another account of these investigations is noted above.

Studies in soil bacteriology.—V, Nitrifying and ammonifying powers of North Carolina soils, F. L. STEVENS, W. A. WITHERS, ET AL. (*North Carolina Sta. Rpt.* 1912, pp. 67–84, figs. 3).—These investigations have already been noted from another source (*E. S. R.*, 27, p. 517).

Studies in soil bacteriology.—VI, Miscellaneous nitrification experiments, F. L. STEVENS, W. A. WITHERS, ET AL. (*North Carolina Sta. Rpt.* 1912, pp. 85–104, figs. 3).—This is a report of miscellaneous experiments made during the course of a series of investigations on the nitrifying and ammonifying powers of different types of North Carolina soils (see above). The experiments include determinations of (1) the inhibiting effect of ammonia sulphate in soil and in solution, (2) the migration of nitrifying bacteria in soil, (3) the effect of drying upon nitrifying efficiency and nitrogen inoculating power, (4) the nitrifying power of soils as determined by the Kellerman and Robinson and by the Stevens and Withers methods, (5) the effect on nitrification of various amounts of ammonium sulphate in the soil, (6) the relative nitrifying efficiency of soils in the incubator room, and in the field, and (7) the effect of lime, cow manure, and a vigorous nitrifying soil on nitrification.

The results in general showed that additions of 0.5 per cent or more of ammonium sulphate retarded nitrification in the soil. "At the end of 12 weeks decided retardation is evident when there was 'additional' ammonia to the amount of 0.5 per cent or more and complete inhibition resulted from the presence of 5 per cent." In solutions at the end of 12 weeks retardation was evident with additions of 1 per cent or more of ammonium sulphate.

There was little or possibly no migration of the nitrifying organisms in the soil. Nitrifying efficiency was much lower in solution than in soil culture.

There was general agreement in the results obtained by the different methods of determining the nitrifying power of soils. The best results as regards nitrification were obtained when ammoniacal nitrogen (in form of ammonium sulphate) was added at the rate of 120 mg. of nitrogen to 400 gm. of soil. A much higher nitrifying efficiency was obtained in flasks kept in the incubation room than in those buried in the soil. A somewhat higher efficiency was obtained in buried flasks than in buried tubes. These results indicate "that soil tests in order to give us knowledge of the phenomena as they occur in the field must be made under conditions of the field." The addition of lime and cow manure increased nitrification, especially during the first month. The results when a vigorous nitrifying soil was added were inconclusive.

The intensity of nitrification in arid soils, R. STEWART (*Centbl. Bakt. [etc.]*, 2. Abt., 36 (1913), No. 19–25, pp. 477–490).—This article cites data already reported in part in bulletins of the Utah Experiment Station (*E. S. R.*, 24, p. 422; 26, p. 616) in support of the conclusion that "there is no reason to assume that the accumulation of nitrates in arid alkali soil indicates a rapid bacterial action at the present time. These accumulations indicate a concentration of the nitrates already in the soil formed by slow bacterial action in the remote past. The application of the irrigation water has simply furnished a medium by which the nitrates may move, or be moved, from one place to another."

From a study of soils of Colorado and Utah, containing large amounts of nitrates, as well as of the materials from which the soils have been derived, the author concludes "that the nitrate accumulations found in these soils are undoubtedly of marine origin. . . . These nitrate accumulations always occur in connection with other water-soluble salts, such as sodium chlorid and gyp-

sum. No nitrate accumulations have been observed in arid soils free from other water-soluble salts."

The author believes that the alkali salts, including the nitrates, were deposited at the time of the formation of the shale from which the soils examined were derived, "and, on the decomposition of this shale in the formation of the soil, the alkali has become incorporated with the latter. The passage of the water through the shale structure also washed out the soluble salts and carried them to the lower lying land."

Water-soluble matter in soils sterilized and reinoculated, T. L. LYON and J. A. BIZZELL (*New York Cornell Sta. Bul.* 326, pp. 207-224, figs. 4).—The authors briefly review investigations on this subject by others and, in continuation of previous work (E. S. R., 23, p. 316), report studies of the nature of the chemical changes brought about in soils by steaming, particularly as to the relation of the bacterial activity to such changes. Three different soil types were used, the sterilized samples being (1) uninoculated, (2) inoculated with fresh soil, and (3) inoculated with heated soil.

The results show "there was a gradual decrease in water-soluble matter on standing and this was more rapid in the soil inoculated with fresh soil for several weeks, but after 6 months the soluble matter was higher in the soil thus inoculated. There was an indication that nitrate-reducing organisms were an important factor in determining the quantities of nitrates formed in the soils used. There was no indication that inoculation with fresh soil introduced organisms that lessened ammonia formation, but it is of course possible that such organisms, if introduced, would not thrive in soil previously steamed. . . .

"At first the soluble matter disappeared most rapidly in all steamed soils inoculated with fresh soil, but the rate of its disappearance gradually diminished until at the end of 6.5 months there was more soluble matter in the soil inoculated with fresh soil than in either the uninoculated soil or in that inoculated with heated soil."

There was strong evidence to show that toxic matter was the controlling factor in the productivity of steamed soils.

The quantity of water-soluble matter was not a measure of the relative toxicity of two different soils. The rapidity of oxidation in the soil, as measured by the oxygen requirement, did not always indicate the rate at which toxicity disappeared, although in one case aeration of the steamed soil, and the growth of plants in that soil, both caused a decrease in toxicity.

Studies in plant nutrition, II, W. H. JORDAN (*New York State Sta. Bul.* 360, pp. 53-77, figs. 8).—This bulletin reports experiments with barley, peas, tomatoes, tobacco, buckwheat, rape, and turnips conducted in a forcing house during 1900-1904 for the purpose of ascertaining the essential minimum amounts of phosphoric acid and potash which must be available to plants for maximum growth.

"In one set of boxes the basal ration supplied all needed elements save phosphoric acid, this being added in progressive quantities to the several boxes. In the other set of boxes the basal ration supplied all the necessary elements save potash, which was added in progressive quantities to the several boxes. . . .

"The growth of the plants was, in most instances, such as would be satisfactory with field-grown crops, the production of dry matter with barley being in two of the three experiments beyond what could reasonably be expected in a farm crop. Up to a somewhat indefinite point the production of plant substance increased with the increase in the supply of the variable constituents, but beyond this point the utilization of both phosphorus and potassium

compounds increased without any consistent and well defined corresponding increase of the plant growth.

"The data secured do not permit the establishment of any definite minimum relation between the intake of phosphorus and potassium and the dry matter produced. The results secured indicate that what a given crop contains of certain elements is not necessarily to be regarded as a measure of what must be supplied in order to meet the needs for maximum growth."

Action of fermenting manure on reenforcing phosphates. W. E. TOTTINGHAM and C. HOFFMAN (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 3, pp. 199-209, figs. 3).—Investigations are here reported in some detail which showed that fermentation for from 4 to 6 months caused a decrease of water-soluble phosphoric acid in manures and mixtures of manures with rock phosphate. This was apparently due, in part at least, to other changes than simple reversion to insoluble phosphates. The addition of chloroform or formaldehyde, which practically inhibited bacterial action, greatly reduced the loss of water-soluble phosphoric acid in mixtures of manure and rock phosphate.

"Dry bacterial cells of manure organisms grown on agar media contained from 4 to 8 per cent phosphoric acid. The growth of manure organisms upon media supplied with the soluble phosphorus of fresh manure-rock phosphate mixtures depressed the water-soluble phosphorus of the media by amounts which were comparable to the losses of water-soluble phosphorus observed in fermenting manures. About one-half the phosphorus of fresh intact bacterial cells was soluble in water. This phosphorus was apparently derived chiefly from inorganic phosphates adsorbed from the media. The remaining phosphorus of the cells was probably present in nuclein compounds.

"Acid phosphate incorporated with fermenting manure underwent essentially the same changes of solubility as did rock phosphate. In the presence of chloroform, however, the acid phosphate decreased markedly in solubility, while with rock phosphate no decrease occurred.

"Application of monocalcium phosphate to barley in pot experiments gave greater immediate returns when the phosphate was applied with previously fermented manure than when it was applied in a fermented mixture of manure and phosphate. The immediate returns from tricalcium phosphate were the same whether it was applied with previously fermented manure or in a fermented mixture. A second crop of barley from the original application of reenforced manures gave a superior yield from the fermented mixture for both phosphates.

"So far as pot experiments indicate conditions in field practice, the final results from mixing rock phosphate with fermenting manure appear to be advantageous. In the case of acid phosphate it appears inadvisable to mix the material with fermenting manure. It is probably better practice to add it to the manure at the time of application to the field."

Nitrogenous fertilizers for field crops. L. MALPEAUX (*Jour. Agr. Prat.*, n. ser., 25 (1913), Nos. 7, pp. 205-207; 8, pp. 237, 238; *Bol. Agr. Téc. y Econ.*, 5 (1913), No. 49, pp. 75-81).—Comparative tests of sodium and calcium nitrates, ammonium sulphate, and calcium cyanamid on oats, potatoes, and beets in 1912 are reported.

On oats sodium and calcium nitrates were about equally effective. Calcium cyanamid was somewhat less effective, but about equal to ammonium sulphate. On potatoes and sugar beets calcium nitrate was somewhat more effective than sodium nitrate. Calcium cyanamid was less effective as regards total yield than ammonium sulphate on potatoes and both were inferior to the nitrates on potatoes and sugar beets, although the highest yield of sugar was obtained with

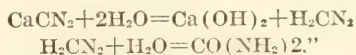
ammonium sulphate. With fodder beets the sodium nitrate gave better results than the other materials.

The relation of the production of alumina to the fixation of nitrogen, S. A. TUCKER (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 3, pp. 191, 192).—This article deals mainly with the reactions involved in the Serpek process, which is stated to be "primarily one for the fixation of nitrogen, but necessarily involves the production of alumina as a by-product and this by-product is all important to the success of the process commercially." The process is briefly compared with other processes for the fixation of nitrogen.

Ammonium sulphate from ammonia and sulphur dioxid, W. FELD (*Sci. Amer. Sup.*, 75 (1913), No. 1944, pp. 217, 218, fig. 1).—This article describes a process in successful operation in the municipal gas works of Königsberg, Prussia, for the direct production of ammonium sulphate from ammonia and hydrogen sulphid in coal gas.

The electrotechnical production of ammonia (*Ztschr. Angew. Chem.*, 25 (1912), No. 44, pp. 2258, 2259; *Jour. Indus. and Engin. Chem.*, 5 (1913), No. 1, p. 75).—Reference is made to two companies engaged in this industry and a third being organized for the purpose in Norway.

Manufacture and uses of cyanamid, E. J. PRANKE (*Chem. Engin.*, 17 (1913), No. 3, pp. 113-115).—The history of the process of cyanamid manufacture is briefly reviewed and methods of manufacture with reactions involved are described. The use of the material as a fertilizer and its action in the soil are discussed, the author accepting Ulpiani and Kappen's conclusion (*E. S. R.*, 24, pp. 226, 323) "that cyanamid applied to the soil is completely converted in the course of a few days into urea, by the catalytic action of the colloids and other constituents of the soil, in accordance with the following reactions:



It is stated that "the urea is further converted by bacterial action and possibly by chemical processes into ammonia, which further reacts with zeolites, humates, and other soil constituents, to form double ammonium salts, that are retained as a part of the soil until further bacterial action or the solvent effect of plant roots makes them available to vegetation."

The use of cyanamid for the production of ammonia, cyanid, dicyandiamid (for use in dyeing), and other derivatives is briefly referred to.

"At present there are 4 factories in Germany, 4 in Italy, 2 in France, and 1 each in Austria, Norway, Sweden, Switzerland, Japan, and America."

On calcium cyanamid as a fertilizer, J. SEBELIEN (*Tidsskr. Norske Landbr.*, 19 (1912), No. 6, pp. 263-276).—The history of cyanamid and the results of fertilizer experiments with it by different investigators are presented. On account of the possibility of losses of nitrogen and the poisonous effects of the fertilizer that have been observed at times, the efforts of manufacturers have lately been directed toward converting the cyanamid into nonvolatile ammoniacal form (ammonium sulphate).

Is it advisable to mix calcium cyanamid with superphosphate before application? P. CHRISTENSEN (*Ugeskr. Landm.*, 58 (1913), No. 4, pp. 51-53).—The author shows that on account of the basic character of calcium cyanamid, which contains about 60 per cent of lime and 18 per cent of nitrogen, the water-soluble phosphoric acid in superphosphate is rendered insoluble within a short time, even when the mixed fertilizer contains only one-eighth of its weight of cyanamid. He therefore advises strongly against mixing the two fertilizers prior to their application.

Production of phosphate rock in Florida during 1912, E. H. SELLARDS (*Tradesman*, 69 (1913), No. 13, p. 40; *Amer. Fert.*, 38 (1913), No. 6, *Sup. Bul.*, pp. 1-3).—It is stated that foreign shipments of phosphate rock from Florida during 1912 amounted to 1,203,005 tons, while the domestic shipments as reported by the producers amounted to 1,219,927 tons.

The utilization of acid and basic slags in the manufacture of fertilizers, W. H. WAGGAMAN (*U. S. Dept. Agr., Bur. Soils Bul.* 95, pp. 18, pl. 1).—This bulletin reports analyses of domestic slags and experiments in the laboratory preparation of slags, using potash-bearing rocks and phosphates mixed with slags. The results indicate "that it may be possible by mixing phosphatic limestone and feldspar with the molten slag to produce a slag of value as a commercial fertilizer."

Alunite and kelp as potash fertilizers, J. J. SKINNER and A. M. JACKSON (*U. S. Dept. Agr., Bur. Soils Circ.* 76, pp. 5).—Comparative tests of the fertilizing effect on wheat seedlings of raw alunite containing 10 per cent of potash, ignited alunite containing 14.7 per cent of potash, and of dry and powdered kelp containing 19.8 per cent of potash, were made by the paraffined wire-pot method of the Bureau of Soils, the different fertilizing materials being used in amounts furnishing potash at the rate of 25, 50, 100, 200, and 500 lbs. per acre. Potassium chlorid and sulphate were used in parallel series of experiments at the same rates.

The results indicated that the dried kelp and ignited alunite were about as effective as potassium sulphate and chlorid. The raw alunite was less effective than the ignited alunite. Nevertheless, the raw alunite used in amounts corresponding to from 50 to 100 lbs. of potash per acre increased the yield about 20 per cent, while the ignited alunite increased the yield on an average about 40 per cent.

Liming for Tennessee soils, C. A. MOOERS (*Tennessee Sta. Bul.* 97, pp. 35, figs. 7).—Experiments extending over a number of years with a variety of crops on typical soils of the State have shown that the soils are as a rule benefited by liming. This result was indicated by chemical analysis which showed a very low percentage of calcium carbonate, even in soils of limestone origin. Burnt lime and ground limestone, used at relative rates of 1 ton of the former and 2 tons of the latter, were about equally effective, the slight difference observed being in favor of the ground limestone. Among the crops used in these experiments which were benefited by liming were corn, sorghum, barley, oats, wheat, cowpeas, soy beans, velvet beans, alfalfa, red clover, and alsike clover. Cotton and peanuts were adversely affected by liming in tests made on the soils of the section of the State where each is grown most extensively. The limus test for determining the lime requirement of soils is described and recommended.

Investigations on the fertilizing action of sulphur, A. DEMOLON (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 9, pp. 725-728).—Continuing previous investigations (*E. S. R.*, 26, p. 819), the author found that when 1 per cent of sulphur was mixed with garden soil and kept moist at a temperature of 20° C. appreciable quantities of sulphuric acid, in form of calcium sulphate, were produced in 40 hours. This reaction was most rapid in nonsterilized soil, indicating the intervention of micro-organisms in the process. Hydrogen sulphid was produced when a fermentable medium containing sulphur was inoculated with soil.

In comparative tests of sulphur, sulphuric acid, sulphurous acid, and carbon bisulphid on beets, the most effective in increasing the yield were carbon bisulphid, sulphurous acid, and sulphur in the order named.

In field experiments applications of sulphur were beneficial except when the soils were abundantly supplied with other fertilizing constituents. Potatoes were especially benefited by applications of sulphur. Cereals were injured by such applications on light soils poor in calcium carbonate. An application of equal parts of sulphur and nitrogen gave as good results as a complete mineral fertilizer containing phosphates, potash, and lime.

The author attributes the fertilizing effect of sulphur to its action on the micro-organisms of the soil and the progressive transformation of sulphur into sulphuric acid, thus supplying sulphur to the plant and rendering soluble other mineral constituents of the soil, particularly potash.

The fertilizing action of sulphur, A. DEMOLON (*Sta. Agron. Aisne Bul.*, 1912, pp. 33-41).—This is an account of experiments reported above.

AGRICULTURAL BOTANY.

The cause of growth in plants, I. G. A. BOROWIKOW (*Biochem. Ztschr.*, 48 (1913), No. 3, pp. 230-246, figs. 3).—As a result of several series of studies carried out on the growth of plants as affected by various acids, bases, and salts, the author believes that growth is possible only under conditions favorable to the process of hydration of the colloids; that rapidity of growth is favored by such conditions, and checked (even if death is not induced through coagulation of the colloids) by their absence. The most important factors in growth are thought to be, under ordinary conditions, warmth and the organic acids. It is said that the degree of influence exerted by the acids depends not only on the concentration of the hydrogen ion, but also upon the character and tendency of the other ion as favorable or unfavorable to growth. Further investigations are proposed regarding these points, also on the significance of cell turgor to growth.

The rôle of acids in germination, GERMAINE PROMSY (*Bul. Soc. Nat. Agr. France*, 72 (1912), No. 10, pp. 916-922).—A study was made of the effect of various organic and inorganic acids on the germination, respiration, growth, etc. of plants. Fleishy seeds and those having dry pericarps were used.

In general the fleshy seeds seemed better able to profit by the presence of acids than the others. The germination was accelerated by dilute solutions of citric, malic, tartaric, oxalic, acetic, hydrochloric, and sulphuric acids. Different species of plants responded differently to the several acids and the optimum concentrations ranged from 0.5 to 5 parts per 1,000. Growth followed increased turgescence, and this was found to be materially influenced by the acids. The organic acids proved superior in this respect.

The author claims that the seeds of maize, wheat, and gourd contain a form of pepsin that is active only in the presence of an acid, while seeds of lupine and some other plants contain a trypsin that is favored by an alkaline medium. The acid solution is held to act upon the diastases in seeds through absorption and to favor or retard germination according to the nature of the ferment.

Sunlight and plant assimilation, A. MÜNTZ (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 5, pp. 368-370).—The author has made a study of the effect of strong and diffused light on plant assimilation. The observations carried on during 1910, 1911, and 1912 are cited, from which it appears that alfalfa produced less material per square meter in 1911, a summer unusually free from clouds, and a larger yield of green material in 1910, when rain was frequent and cloudy skies prevailed.

In comparison with these field observations, experiments were carried on in which equal amounts of water were given to alfalfa during the same period

and the amount of dry matter was determined. The results of these experiments seem to confirm those of the observations made in the field.

The author is led to believe that assimilation is limited more by the proportion of carbon dioxid available than by the intensity of the light.

The effect of supramaximal temperatures on plants, W. W. LEPESCHKIN (*Ber. Deut. Bot. Gesell.*, 30 (1912), No. 10, pp. 703-714, figs. 2).—A discussion is given of the effect of temperatures above the maximum for plant functions. Experiments were conducted with *Tradescantia* and beets and the coagulation of the protoplasm by the high temperatures was observed. The relation between temperature and duration of exposure is shown by a series of curves and comparisons are drawn between these curves and the logarithmic curves based on the relation of light to temperature.

Is the form of trees determined by wind? P. JACCARD (*Jour. Forest. Suisse*, 1912, pp. 129-140; *abs. in Bot. Centbl.*, 122 (1913), No. 1, p. 5).—Among the causes which influence more or less strongly the activity of development of various aerial portions of trees, the author notices especially the variations in intensity and rapidity of the ascending water current. Comparison of sections of the roots with those of the trunk and branches, also of their anatomical structure, leads him to the conclusion that rapidity of water transport to the various vegetal organs plays an essential part in the rate of development, and that the variations therein observed are determined much more by trophic than by mechanical factors.

Sex anomalies produced in Japanese hops and hemp by diminished transpiration, J. TOURNOIS (*Compt. Rend. Soc. Biol. [Paris]*, 73 (1912), No. 37, pp. 721-723).—In previous publications (*E. S. R.*, 27, p. 827) the author pointed out the influence of late seeding and of strong sunlight on the abnormal flowering of Japanese hops and hemp. Subsequent experiments, which are described in the present paper, show that seedlings grown in dry and saturated air presented marked anomalies where the transpiration was materially reduced.

On the value and a new method of estimating the respiratory quotient of green plants, L. MAQUENNE and E. DEMOUSSY (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 4, pp. 278-283).—In a previous publication (*E. S. R.*, 28, p. 631) the authors have described methods for estimating the respiratory quotient of plants. In testing these methods there has been found to be a constant error of about one-fiftieth of the total, especially when the respiratory quotient is near 1. The authors have determined the respiratory quotient at a temperature of 25° for a large number of species of plants, from which it is learned that the respiratory quotient of green leaves is always greater than 1 during the active period of vegetation. A decrease in the respiratory coefficient below unity is a sign of degeneration.

The new method described is based on the estimation of the relative proportion of nitrogen in the air of closed vessels in which plants are placed. In nearly every instance the quantity of nitrogen was found greater at the end of the experiment than at the beginning.

Apparent fallacies of electrical response in cotton plants, W. L. BALLS (*Ann. Bot. [London]*, 27 (1913), No. 105, pp. 103-110, fig. 1).—A description is given of experiments with cotton plants, conducted to determine their healthfulness, by the method employed by Waller in his experiments on electrical response or blaze currents in plants (*E. S. R.*, 26, pp. 227, 228). The experiments, in attempting to utilize electrical response as a test for health in Egyptian cotton plants, resulted unsuccessfully. Improvements were devised, consisting of a better method of control and a method of balance, and it is thought that by their application the healthfulness of plants can be determined.

Recent studies on carbon assimilation, G. POLLACCI (*Bul. Soc. Bot. Ital.*, 1912, No. 8, pp. 208-211).—In order to test the view that plants assimilate carbon only from carbon dioxide absorbed from the atmosphere by their green parts, the author experimented with plantlets of *Acer pseudoplatanus* and *Morus nigra* from 5 to 15 cm. in length, previously deprived of starch. The roots were supplied with a nutritive solution, into which atmospheric air was freely admitted, while the aerial portions were sealed apart in a chamber with provision for entirely freeing the confined or the admitted air from carbon dioxide.

It is stated that in a few days new leaves were grown and starch was developed in appreciable quantity. The question is not yet regarded as settled whether the carbon thus utilized was obtained from preexisting tissues by a process of intramolecular respiration, or from the water absorbed by the roots and coming in contact with the chloroplasts.

Variations in the sodium chlorid content of nonhalophytes, L. MARGARET BLACKLEDGE (*Ann. Bot. [London]*, 27 (1913), No. 105, pp. 168-171).—Observations were made on a large number of plants at different distances from the sea coast to determine the variation in the amount of sodium chlorid present in their leaves. The plants analyzed were *Acer pseudoplatanus*, *Ulmus campestris*, and *Ilex aquifolium*, and the amount of sodium chlorid directly absorbed by the leaves from the atmosphere was determined. From the results of the investigation, it is held that the leaves of such plants receive their supply of sodium chlorid very largely from that occurring in the atmosphere.

The occurrence of manganese in plants, F. JADIN and A. ASTRUC (*Jour. Pharm. et Chim.*, 7. ser., 7 (1913), No. 4, pp. 155-161).—The authors give the results of analyses of about 65 species of plants, in which it is shown that manganese is widely distributed in the plant kingdom. The amount present was found to vary with the different organs of the plants examined. The manganese content of different plants belonging to the same family could not be taken as indicative of the average content to be expected in other members of the order. A number of species of parasites were examined, and there was observed to be no relation between the manganese content of the parasite and its host. Chlorophyll-bearing portions of the plant as a rule were richer in manganese than the subterranean parts.

On the substitution of glucinium for magnesium and zinc in cultures of *Sterigmatocystis nigra*, M. JAVILLIER (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 5, pp. 406-409).—As a result of experiments on the substitution of glucinium for magnesium and zinc in culture solutions, it was found that glucinium could not replace magnesium, which appears to be an indispensable element for the nutrition of this fungus, nor could it replace zinc as a catalyzing agent.

The replacement of zinc by glucinium in cultures of *Aspergillus niger*, C. LEPIERRE (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 5, pp. 409-411).—From experiments conducted with this fungus grown in culture media the author claims that glucinium can be assimilated and fixed by the plant, and he believes that cadmium and glucinium are not the only elements capable of replacing zinc in Raulin solution for the growth of molds.

The decomposition of urea, uric acid, hippuric acid, and glycocoll by mold fungi, I, II, III, A. KOSSOWICZ (*Ztschr. Gärungsphysiol.*, 1 (1912), No. 1, pp. 60-62; 2 (1912), Nos. 1, pp. 51-55; 2, pp. 81-83).—The author states that in the course of his experiments with *Botrytis bassiana*, *Penicillium crustaceum* (P. *glaucum*), P. *brevicaule*, *Cladosporium herbarum*, *Phytophthora infestans*, *Aspergillus glaucus*, A. *niger*, *Isaria farinosa*, *Mucor*, and *Fusisporium* all proved able under suitable conditions to utilize as a nitrogen source

urea, uric acid, glycocoll, and hippuric acid. The results obtained by varying the nutritive solutions are detailed in connection with each experiment.

Assimilation of nitrites by mold fungi, I, A. Kossowicz (*Ztschr. Gärungsphysiol.*, 2 (1912), No. 1, pp. 55-58; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 37 (1913), No. 4-6, p. 74).—In experiments made with the mold fungi enumerated in the preceding abstract, all were found able to utilize nitrites as nitrogen sources. From the fact that only two could be induced to use ammonia in this way, the author concludes that these mold fungi take up the nitrite ion directly without previous reduction to ammonia. With otherwise suitable nutritive solutions, moderate concentrations of nitrites in solution produced no marked deleterious effect upon the mold fungi. Dextrose and cane sugar proved to be much better sources of carbon than mannite in these experiments.

The relation of some mold fungi to calcium nitrate, I, II, A. Kossowicz (*Ztschr. Gärungsphysiol.*, 1 (1912), No. 2, pp. 124, 125; 2 (1913), No. 3, pp. 154-157).—The results of several series of investigations carried out under varied conditions with the 10 fungi enumerated above indicate that a few of these thrive with calcium nitrate in the nutritive medium, while others are unfavorably influenced. It is thought probable, however, that the injurious action shown by that salt is in part due to its impurities, and these would thus become important in connection with its use as a fertilizer.

The assimilation of guanin and guanidin by mold fungi, I, A. Kossowicz (*Ztschr. Gärungsphysiol.*, 2 (1912), No. 2, pp. 84-86).—Experimenting with the mold fungi above mentioned, the author found that all were able to utilize guanin as nitrogen source, also guanidin (*Aspergillus glaucus* and *Cladosporium herbarum* developed slowly, however), and that all flourished with guanin as source of both carbon and nitrogen under conditions favoring the formation of ammonia. A further report on the utilization of guanidin in this last relation is promised.

Sulphocyanic compounds as source of carbon, nitrogen, and sulphur for mold fungi, I, A. Kossowicz and L. von Gröller (*Ztschr. Gärungsphysiol.*, 2 (1912), No. 1, pp. 59-65).—The authors carried out experiments with iron, sodium, potassium, and ammonia compounds of sulphocyanic acid on the 10 mold fungi named above to ascertain any possible toxic relations and the ability of the fungi to utilize the carbon, nitrogen, and sulphur in the compounds.

It is stated that all 10 fungi were able to utilize these compounds as sources of nitrogen and sulphur, but not as exclusive sources of carbon or as an exclusive common source of carbon and nitrogen. Most of these compounds seem to exert a depressing effect upon the development and fructification of the fungi. Mannite was found to be inferior to dextrose as a constituent of the nutritive medium.

Preliminary report on the relations of yeast and mold fungi to sodium thiosulphate, A. Kossowicz and W. Loew (*Ztschr. Gärungsphysiol.*, 2 (1912), No. 1, p. 78; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 37 (1913), No. 4-6, p. 86).—This brief preliminary report of the authors' investigations states that 6 yeasts investigated by them utilized this thiosulphate as a source of sulphur with evolution of hydrogen sulphid. Mold fungi also assimilated thiosulphate but otherwise showed different relations thereto. *Botrytis bassiana*, *Cladosporium herbarum*, *Penicillium brevicaulis*, *Aspergillus glaucus*, *Isaria farinosa*, and *Fusisporium* assimilated this compound directly without formation of hydrogen sulphid or of sulphuric acid, without deposit of sulphur, and with no marked oxidation of thiosulphate. Under like conditions *Mucor* showed evolution of hydrogen sulphid. *P. glaucum* and *A. niger* formed polythionates or sulphuric acid and in the latter case deposited free sulphur in the mycelial threads. It is stated that all these mold fungi showed good development in a medium contain-

ing 10 per cent thiosulphate, and all but *A. glaucus*, *A. niger*, and *Mucor* flourished in 40 per cent sodium thiosulphate.

Relations of yeast and mold fungi to sodium thiosulphate, A. KOSSOWICZ and W. LOEW (*Ztschr. Gärungsphysiol.*, 2 (1912), No. 2, pp. 87-103).—This is a more detailed report of work summarized above.

Spore formation in *Aspergillus fumigatus*, B. SAUTON (*Compt. Rend. Soc. Biol. [Paris]*, 74 (1913), No. 1, pp. 38, 39).—Previous investigations by the author, Javillier, and Bertrand (*E. S. R.*, 26, p. 431; 27, pp. 129, 228; 28, p. 527) have shown the dependence of certain molds, especially *A. niger*, upon various substances for their development. In the present paper he gives an account of experiments with *A. fumigatus* grown in Raulin culture medium, and as a result concludes that sulphur, iron, manganese, and potassium are as indispensable to the formation of the conidia of *A. fumigatus* as is oxygen.

Bacterial tubercles in leaves, H. MIEHE (*Umschau*, 16 (1912), No. 47, pp. 989-991, figs. 4; *abs. in Ztschr. Landw. Versuchsw. Österr.*, 15 (1912), No. 12, p. 1303; *Bot. Centbl.*, 122 (1913), No. 1, pp. 10, 11).—The author gives an account of his studies on the alleged hereditary symbiosis of *Ardisia crispa* with bacteria which are found in the buds and growing points, later developing in the intercellular spaces and forming marginal tubercles on the leaves. Cultures of *Ardisia* with and without nitrogen supply at first showed no differences, but after some months the former outgrew more and more the latter cultures.

Testing cultures of nodule-forming bacteria, K. F. KELLERMAN (*U. S. Dept. Agr., Bur. Plant Indus. Circ.* 120, pp. 3-5, fig. 1).—On account of the occasional failure of cultures of *Bacillus radiculicola* to inoculate a crop properly, investigations have been carried on to determine whether the bacteria which have grown vigorously in culture media have deteriorated to the extent of being unable to infect the leguminous roots and to produce nodules. During the past year experiments were conducted in which plants were grown under control conditions but as nearly normal as possible, and by the procedure adopted it has been possible to distinguish sharply between the inoculating power of apparently identical strains of bacteria. In the future all stock cultures intended for distribution by the Department are to be tested in this manner.

Smoke injury to plants, T. BOKORNY (*Chem. Ztg.*, 36 (1912), No. 111, pp. 1050, 1051; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 600, II, p. 980).—The author concludes from his experiments that the high sensitiveness of some plants to tobacco smoke noted by Molisch (*E. S. R.*, 27, p. 830) is not due to nicotin, which in small quantities produces practically no injurious effect, nor to carbon monoxid, which even in large quantity can only retard germination, but that it is due to ammonia, which is thought to combine with the protoplasm of the plant.

The weeds of arable land, III, WINIFRED E. BRENCHEY (*Ann. Bot. [London]*, 27 (1913), No. 105, pp. 141-166).—In continuation of previous investigations on the relations existing between weeds and soils (*E. S. R.*, 27, p. 29), the author finds that there is a close association between the weeds of arable land and the soils in which they grow, so far as drift soils as well as those derived from the underlying rocks are concerned. This association may be either general or local. A much closer relationship is believed to exist between weeds and crops than has hitherto been recognized. This is considered to be largely due to the conditions of cultivation of the various crops and to their place in the rotations practiced.

The chemical constitution of the latex of *Euphorbia* and the systematic position of the plants, J. VON WIESNER (*Sitzber. K. Akad. Wiss. [Vienna]*, *Math. Naturw. Kl.*, 121 (1912), I, No. 2, pp. 79-101).—The author claims to

have shown, as the result of long investigations, that the composition of the juice of Euphorbia is sufficiently characteristic and constant to be of value as a mark of the genus. Caoutchouc is said to be present but in very small quantity. Euphorbon is always found, and resins are always a prominent constituent.

Heterozygosis in evolution and in plant breeding, E. M. EAST and H. K. HAYES (*Biol. Centbl.*, 33 (1913), No. 1, pp. 1-4).—This paper gives a résumé of experiments on the effect of crossbreeding and inbreeding with maize and Nicotiana, the details of which have been noted elsewhere (E. S. R., 27, p. 428).

The improvement of medicinal plants, F. A. MILLER (*Lilly Sci. Bul.*, 1. ser., 1912, No. 2, pp. 25-35, pls. 3).—The author points out the desirability of applying the principles of plant breeding to various medicinal plants in order to obtain better and more uniform products, and briefly describes the results of some work on seed selection with burdock and digitalis.

FIELD CROPS.

Plowing and cultivating soils in California, C. B. LIPMAN (*California Sta. Circ.* 98, pp. 4).—This circular offers suggestions in regard to handling California soils, discussing the objects of plowing and cultivating, reasons for the need of deep plowing in California, and the depth and time of plowing and cultivating.

[Report of the] division of agronomy, C. B. WILLIAMS (*North Carolina Sta. Rpt.* 1912, pp. 16-20).—This reports experiments on the removal of corn suckers (see p. 35), variety tests with cotton, wheat, oats, cowpeas and soy beans, fertilizer experiments with phosphate slag, phosphate rock, Peruvian guano, miscellaneous nitrogenous fertilizer tests with corn and cotton, experiments in planting various parts of the ear, and plant breeding work with cotton and wheat.

It is mentioned that the dry weather and severe winter reduced the oat yields, which for the 5 best varieties ranged from 28.7 to 32.2 bu. per acre. The time of maturity ranged from 205 to 222 days. It is noted that in the cotton test Russell Big Boll seemed to be better suited to a rich soil than a poor one.

Second annual report of the Miami County experiment farm, C. MCINTIRE (*Ohio Sta. Bul.* 256, pp. 235-251).—In a fertilizer test with corn previously noted (E. S. R., 28, p. 40), tabulated results show gains in 1912 with 200 lbs. acid phosphate of \$4.31; with 250 lbs. phosphate and potash, \$5.57; with 300 lbs. complete fertilizer, \$2.43; and with 300 lbs. complete fertilizer plus 2,000 lbs. powdered limestone, \$2.82. In variety tests the yields per acre with soy beans ranged from 20.41 bu. with Medium Green to 25.75 bu. with Ebony; with corn from 45.85 to 85.14 bu., both with Darke County Mammoth; with oats from 71.39 bu. with Wideawake to 78.59 bu. with Swedish Select; and with wheat from 16.67 bu. with Kharkov to 20.67 bu. with Turkey Red.

Data obtained at the main station along these lines are also summarized for comparison.

The work of the Belle Fourche experiment farm in 1912, B. AUNE (*U. S. Dept. Agr., Bur. Plant Indus. Circ.* 119, pp. 15-22, figs. 5).—This paper outlines the work in progress in cooperation with several offices of the Bureau of Plant Industry and Forest Service and gives some tabulated data of 1912 crop yields under irrigation and dry culture in 2, 3, 4, and 6-year rotations.

The work of the San Antonio experiment farm in 1912, S. H. HASTINGS (*U. S. Dept. Agr., Bur. Plant Indus. Circ.* 120, pp. 7-13, figs. 4).—This work supplements Circular 34 (E. S. R., 21, p. 535), and gives tabulated results of

rotation and tillage experiments, including the average yields of corn, cotton, Dwarf milo maize, oats, and sorghum for 1907 to 1911 and the yields for 1912. Corn and Dwarf milo maize gave increased yields per acre of 3.9 and 19.5 bu. respectively when treated continuously from 1910 to 1912 with barnyard manure, and cotton 98 lbs. additional of seed cotton. Three-year results with summer fallow for corn, oats, and cotton indicate that this practice is not advisable for the conditions at San Antonio.

[Crop experiments at San Antonio experiment farm], S. H. HASTINGS (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 120, pp. 17-20, fig. 1*).—The crops in these experiments include forage crops (E. S. R., 28, p. 735), cotton, grain sorghum, and broom corn. In a cotton variety test Vergatus gave the highest yield, but its short staple made it undesirable. Sudan durra gave 57 bu. of grain per acre and Dwarf milo maize 63 bu., while the best strain of corn gave only 40 bu. per acre. Of 3 varieties of broom corn tested, standard G. I. No. 446 gave the largest yield, 730 lbs. per acre.

The work of the Huntley experiment farm in 1912, D. HANSEN (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 121, pp. 19-28, figs. 6*).—In an irrigation experiment at Huntley, Mont., with field crops in rotation, the maximum yields obtained in 1912 were as follows: Montana alfalfa, 1 ton; Burbank potatoes, 413 bu.; Kleinwanzleben sugar beets, 14.37 tons; Minnesota No. 13 corn, 42.8 bu.; Pringle Champion wheat, 31.6 bu.; Swedish Select oats, 66.8 bu.; and Minnesota No. 25 flax, 19.4 bu. Of 8 different grass mixtures at the experiment farm, timothy and alfalfa gave the highest yield of 5.31 tons in 1912.

Early planting of alfalfa resulted in somewhat higher yields than late planting. Results as to the influence of a nurse crop were inconclusive.

In an experiment on distance of planting and thinning of sugar beets, 18 in. rows, thinned to 12 in., gave the best results, 17.8 tons of beets per acre. In an irrigation test with flax, very little difference in yield resulted owing to the wet season, the average being 18.6 bu. per acre. In a corn test, Northwestern Dent and Brown County Yellow proved best adapted and yielded 58.3 and 51.5 bu. per acre, respectively.

In an experiment to reduce the salty condition of a portion of the tract, by leveling the ground and making a border around the area on which was practiced a system of alternate light irrigation and cultivation the salt content was reduced from 0.52 per cent in 1911 to 0.28 per cent in 1912.

Experiments with field peas and soy beans, P. J. WHITE (*Washington Sta. Popular Bul. 50, pp. 4*).—This reports work, the progress of which has been previously noted (E. S. R., 25, pp. 533, 639).

The three best seed-producing field peas at Pullman, Bangalia, Amraoti, and Kaiser produced in 1912, 49, 44, and 41 bu., respectively, of threshed peas per acre. About 3 pk. of seed per acre gave the most satisfactory yields of hay, and the rate of about 3 bu. the best yield of seed. May 13 proved to be the most propitious time for seeding.

A mixture of about 3 pk. of oats with 4 to 6 pk. of peas gave the best results as a hay mixture. Soy beans were considered a failure for East Washington, as they failed to mature and produced much less forage than field peas.

Alfalfa, W. T. CLARKE (*California Sta. Circ. 87, pp. 6*).—This circular gives general information as to alfalfa culture in California covering soil, climatic, and water requirements, preparation of the land, seeding, inoculation, irrigation, and time of cutting.

Nitrogen and mineral constituents of the alfalfa plant, J. W. AMES and G. E. BOLTZ (*Ohio Sta. Bul. 247, pp. 755-773*).—"This bulletin presents data secured from a study of the mineral elements of the alfalfa plant grown on soil under conditions which have produced marked variations in the yield and com-

position of the crop. Attention has been directed to (1) effect of phosphorus when used alone, and in combination with potassium and nitrogen; (2) influence of quantity of lime applied to the soil; (3) variation in first and second cuttings; (4) amounts of mineral elements soluble in water; and (5) separation of the nitrogen and phosphorus bodies." The data are for the most part reported in tabular form. Among the conclusions drawn are the following:

"Alfalfa cut in bloom contains the largest amounts of the more valuable plant foods and nutritive constituents in the leaves. . . . When the fertilizer used contained both phosphorus and nitrogen, the increase in the amount of phosphorus over that found in the crop from unfertilized soil was not as great as where phosphorus without nitrogen was applied. . . . Increasing the amount of calcium and magnesium in the soil by the addition of lime containing 55 per cent calcium oxid and 40 per cent magnesium oxid has caused a greater proportion of calcium and magnesium to be absorbed by the plant. Where this is the case the yield has been decreased. . . . The percentages of nitrogen, phosphorus, potassium, and calcium are higher in the first cutting of alfalfa, where the yields were larger, than in the second cutting. The large amount of these elements removed indicates a rapid depletion of the essential mineral constituents from the soil. The nitrogen content of alfalfa is less in the second cutting than in the first, and increases in the third cutting. Rain removes a considerable portion of the mineral and food elements which are not securely combined in the alfalfa plant. . . . Approximately 66 per cent of the nitrogen in the first cutting is protein, and 77 per cent in the second cutting. The amin nitrogen in the crop of the first cutting is increased by the larger application of lime. About 50 per cent of the total phosphorus of the alfalfa plant exists in the form of organic phosphorus."

Under the most favorable circumstances the loss of leaves may be as high as 15 per cent of the total crop.

Arabian alfalfa, R. MCKEE (*U. S. Dept. Agr., Bur. Plant Industry Circ. 119, pp. 25-30*).—This paper describes the life history and temperature requirements of Arabian alfalfa, which was introduced into the United States in 1902, with data on yields produced at Chico and Mecca, Cal., since 1906. Some of the conclusions of the investigators are as follows:

"This variety is not hardy to severe winter conditions and can be grown successfully only in sections having a very mild climate. After cutting, the plants make new growth more quickly than any other variety. . . .

"In the first 2 years Arabian alfalfa makes a much heavier early-spring and late-fall growth than ordinary alfalfa. . . .

"The roots of Arabian alfalfa are very soft and gophers attack them in preference to other varieties. The short life period, normally but 3 years, is an inherent characteristic. On account of its upright soft crown and soft roots Arabian alfalfa is severely injured by close pasturing or heavy trampling.

"This variety can not be recommended for use except in a short rotation, and even then it should be used for soiling or hay purposes only."

Floral abnormalities in maize, J. H. KEMPTON (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 278, pp. 18, pls. 2, figs. 2*).—The study of the abnormal forms and displaced parts of the inflorescence of maize in this bulletin was carried on as a means of tracing the evolutionary history of the plant. The type used was mainly the pod corn (*Zea tunicata*), and hybrids with Hopian, Chinese, Salvadoran, and Mexican varieties.

The author draws the following conclusions: "Inverted seeds have been found on the male and female inflorescences of maize. These inverted seeds are developed from the lower flower of the spikelet, which is normally aborted. Flowers having ovaries and stamens always had the normal number, three, if

the stamens were fertile. Flowers having both ovaries and sterile stamens often had less than 3 stamens. Fertile and sterile stamens were never found in the same flower. Spikelets with 2 ovaries never had any fertile stamens, but sometimes had from 1 to 3 sterile stamens.

"The occurrence of a larger percentage of 2-flowered spikelets near the tip of the female inflorescence may be taken to indicate that the tip of the ear is less highly specialized than the remainder of the ear. That there is a well-defined tendency for both male and female spikelets to become many flowered is evidenced by the fact that 1 spikelet has been found with 3 seeds, and male spikelets with many more than the normal number of stamens are of common occurrence. The development of 2 ovaries in 1 spikelet is not definitely correlated with the abortion of the other spikelet of the pair. A few cases have been found where 4 seeds have developed from the 2 spikelets of a pair and many pairs that have produced 3 seeds. The development of 2 ovaries in 1 spikelet must be simultaneous, as a large number of cases have been found where the 2 seeds from 1 spikelet have grown together with a single pericarp. These connate seeds had been fertilized through a double silk which was attached to the pericarp near the union of the 2 seeds. Connate seeds are a distinct phenomenon from single seeds with a double embryo, 2 of which have been seen.

"The development of 2-flowered female spikelets is looked upon as a reversion to a more primitive type, the tendency of evolution being toward more complicated types with more highly specialized parts. Neither *Euchlaena* nor *Tripsacum*, the 2 nearest known relatives of *Z. mays*, have 2-flowered female spikelets, and the occurrence of this character in maize is held to strengthen the relationship between *Zea* and the *Andropogoneæ*, already indicated by the occurrence of androgynous flowers."

Heredity of a maize variation, G. N. COLLINS (*U. S. Dept. Agr., Bur. Plant Indus. Bul.* 272, pp. 23, pl. 1, fig. 1).—In 1909 a white ear appeared in a carefully selected yellow variety of corn under circumstances indicating that the ear must have arisen as an abrupt mutative change of character. The ear was fully matured and well filled; the cob, red in the original variety, was pure white; and the seeds appearing pure white had in most cases a very faint trace of yellow near the base. A report on the progeny of this albinistic ear through the first, second, and third xenia generations is given and a study of a cross of this ear with a pure white dent variety and with the Hopi variety is also discussed.

In a review of the results, the author states that in a general way the pure-seed progenies of the albinistic ear resulted in all shades of yellow from the merest trace to the fully developed orange of the variety from which the mutation originated. It is pointed out that the pronounced tendency for the seeds to fall into two groups representing 25 and 75 per cent of the total number shows that the inheritance is Mendeloid, though not definitely alternative, and that this grouping suggests that in a single character with somewhat variable dominance is involved. The appearance in some of the ears of a class apparently pure white, representing approximately 6.25 per cent, is regarded as suggesting that two factors are involved but that under those conditions the definite class, representing 25 per cent of the seed in the same ears that show the pure-white class of 6.25 per cent, can not be readily explained on the factor hypothesis. From a theoretical standpoint, the fact considered the more significant is that while the segregation was usually numerically correct, it was by no means complete, that is, the dominant character, yellow endosperm, was not completely absent from individuals of the recessive class.

It is concluded that the results in this instance seemed to demonstrate that while the original characters reappear they are not the same, that is, the segregation is not complete. The author believes that imperfect segregation must be taken into consideration as an obstacle to securing combinations of characters by hybridizing, and that the occurrence of Mendelian ratios can not be taken as conclusive evidence that subsequent selection will not be necessary to establish the full expression of characters.

Inheritance of waxy endosperm in hybrids with sweet corn, G. N. COLLINS and J. H. KEMPTON (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 120, pp. 21-27, fig. 1*).—This paper reports the work of crossing a Chinese variety of white corn having a waxy endosperm (E. S. R., 22, p. 443) with black Mexican sweet and with Voorhees Red sweet.

The first cross produced only horny kernels that were identical with those from ordinary field corn. The second generation, every ear of which bore seeds of all 3 classes, waxy, sweet, and horny, segregated into approximately a 9:4:3 ratio. This indicates that the sweet and waxy characters are the result of independent factors, and that one out of every 4 sweet seeds represents a new type of sweet corn.

Specific gravity determinations of the different classes showed no significant differences, so that the differences in weight must be due to differences in size.

Economic value of corn suckers, C. B. WILLIAMS and W. C. ETHERIDGE (*North Carolina Sta. Rpt. 1912, pp. 37-40*).—Continuing previous work (E. S. R., 26, p. 828), notes are given on the effect of soil fertility, distance of planting, variety, and season.

During the entire period of test, from 6.4 to 14.1 times as many suckers were found on corn on high-producing as on low-producing soil. In 4-ft. rows, 30-in. spacing in the row produced from 7.8 to 650 per cent more suckers, varying with the fertility of the soil, than 20-in. spacing. The prolific varieties produced in a 3-year average 2.6 times more suckers that bore ears than the 1-ear varieties. An unfavorable growing season decreased the percentage of suckers.

As some characters affected by the removal of suckers are mentioned prolificacy, size of ear, yield of grain, percentage of grain to cob, stover, and combined value of grain and stover. It is noted that in general the results did not warrant drawing conclusions on these topics, except in the case of the combined value of grain and stover, which was reduced one-seventh in a 3-year average of from 8 to 61 varieties by the removal of the suckers.

Cotton experiments, 1912 (*Mississippi Sta. Bul. 161, pp. 29*).—This bulletin reports a continuation of earlier cotton experiments in Mississippi (E. S. R., 27, p. 433), and consists of 4 papers.

Results from the Central Station are reported by J. R. Ricks and E. C. Ewing (pp. 4-15). A variety test, including 27 varieties of cotton, resulted in a maximum yield of 656 lbs. of lint per acre, produced by Wannamaker Cleveland, and a minimum of 390 lbs. by World Wonder. The total crop valuation in the first instance reached \$96.79, and in the second \$63.04.

In a 6-year fertilizer test, 8 tons of manure produced the largest average yield of seed cotton, 1,981 lbs. per acre, while 288 lbs. each of cotton-seed meal and acid phosphate per acre gave the smallest yield of 1,022 lbs. Results as to the relative earliness from fertilized plats as shown by the different pickings, effect of manure and kainit in preventing rust, varying distances of rows and drills, and topping of the plants are also given in tabular form.

Reports are also given of variety and fertilizer tests at the McNeill Substation, by E. B. Ferris, and the Holly Springs Substation, by C. T. Ames; variety and spacing tests at the Delta Substation are reported by G. B. Walker.

Methods of securing self-pollination in cotton, R. M. MEADE (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 121, pp. 29, 30, fig. 1*).—This paper mentions methods tried by various investigators to secure self-pollination in cotton, and describes a new method of using either ordinary rubber bands or wire paper clips in such a way as to prevent the opening of the petals but at the same time allowing expansion for normal development of the stamens and assuring pollination. An advantage of this method is the speed with which the bands or clips may be applied.

The culture of Durango cotton in the Imperial Valley, A. McLACHLAN (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 121, pp. 3-12*).—This paper gives suggestions and directions for growing the Durango cotton in the valley (E. S. R., 28, p. 833), and points out the great importance of planting only pure seed so as to maintain high quality and improve the staple output of the valley.

The discussion covers centralized ginning, clean picking, planting in furrows and volunteering, irrigation, cultivation, planting, preparation of the land, proper culture to produce good fiber, and handling plantings of mixed seed.

Oats, C. G. WILLIAMS and F. A. WELTON (*Ohio Sta. Bul. 257, pp. 255-283, fig. 1*).—This bulletin gives data regarding variety, size, and source of seed, and protein content of oats, and tests with a few varieties of barley and other spring crops, and gives averages including work previously reported (E. S. R., 15, p. 243; 20, p. 1030) and subsequent reports through 1912.

Twenty-year averages in the variety tests ranged from 53.14 bu. per acre (Wideawake) to 60.77 bu. (Improved American).

"Of the varieties tested throughout the past 9 years, the highest five in the order of their rank are Siberian, Big Four, Silver Mine, Improved American, and Sixty Day.

"On a 50-acre tract of land, the judicious use of manure, fertilizer, and limestone in connection with a systematic rotation of corn, oats, wheat, and clover, has resulted in a net annual return per acre of \$6.50.

"On the basis of the average of 8 tests extending through 4 years, the yield of disked plats exceeds those of plowed and no previous preparation plats by 3.34 and 4.63 bu., respectively.

"On an average of 6 years' work, in which the extreme dates of seeding were March 22 and May 10, the results have generally favored the earlier seedings.

"As an average of 9 years' work, in which the rates of seeding per acre have varied by 1 peck and have ranged from 4 to 12 pecks inclusive, the highest net yield per acre has been secured from the use of 9 pecks per acre.

"In field work where the separation of seed was made by means of a fanning mill, the yield of the 'large' exceeded that of the 'unscreened' by 3 pecks per acre. This is an average of 4 years' work. As an average of 9 years' work the yield of the 'large' exceeded that of the 'small' in the uniform and varied rates of seeding by 2.75 and 4.06 bu. respectively, and on the average of both rates by 3.41 bu. As regards quality of the two, there was no noticeable difference.

"Oats from the North and Northwest may be expected to yield about the same as home-grown seed and they seem to gain little from acclimatization. With one exception, the 7 varieties introduced from Sweden and England in 1908 have been found inferior to the average of our home-grown varieties.

"In protein content little difference was found in different varieties, but with respect to seasons the variation was quite marked, and, with the exception of 1 year, varied inversely with the rainfall.

"No spring crop has been found equal to oats under conditions such as prevail at Wooster. Barley, and especially the Oderbrucker variety, is the most promising substitute discovered thus far."

Selection of seed potatoes in South Dakota, A. N. HUME and M. CHAMPLIN. (*South Dakota Sta. Bul. 140, pp. 20-32, figs. 2*).—The yield from large seed tubers, averaging 5.7 oz. each, cut into 4 pieces averaging 1.4 oz. each, in one instance was 28 per cent greater than the yield from smaller tubers averaging 3.1 oz., also cut into 4 pieces. In another instance it was 20 per cent greater. The average weight of the tubers from the larger seed was 4.06 oz. and from the smaller seed 4.01 oz.

[Cultivation and fertilizer experiments with sugar cane], J. T. CRAWLEY (*Porto Rico Sugar Producers' Sta. Rpt. 1912, pp. 6-14*).—In a comparison between hole and furrow planting very little difference was observed, a slightly larger percentage of sucrose following the former method and a larger total yield of beets from the furrow method in one test and the hole method in another.

In a series of fertilizer tests the highest results followed the use of a complete fertilizer containing double the usual amount of nitrogen. The application of 12 cartloads of mud press cake scattered over one-half acre of land resulted in an increased yield of 4.29 tons of cane per acre. Wide distance in planting gave a higher percentage of sugar than close planting, but the latter method produced the heavier total yield and was preferred. The work of other investigators along this line is discussed.

Variety tests are also reported, the highest yield being 38.4 tons of cane per acre with B208.

Wild wheat in Palestine, O. F. COOK (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 274, pp. 56, pls. 15, figs. 11*).—This bulletin gives a further account of the cereal discovered in Palestine by Aaronsohn (*E. S. R., 24, p. 136*), brings out several additional factors regarding the characters and habits of the plant, including the presence of specialized adaptations to facilitate cross-fertilization, and suggests the acclimatization of cross-fertilized forms of the domesticated type of wheat.

It was established that this is a normally cross-fertilizing variety, as it possesses exerted anthers and open glumes. In some cases young, unripe stamens were found in open flowers along with apparently adult, receptive stigmas. These flowers were obviously protogynous.

From a biological standpoint the wild wheat appears superior to the domesticated plant in its adaptation for protection and sowing of the seed. The wild wheat has the rachis jointed, with the spikelets firmly fastened to the joints, while the domesticated wheat has the rachis entire and the spikelets jointed to the rachis. The glumes are very large and tough and are grown fast to the joints of the rachis, making it a difficult wheat to thresh. Although two seeds are present in most of the spikelets, it is unusual for more than one of them to germinate.

In discussing the relation this wild wheat bears to prehistoric civilization, the author points to the fact that on account of the difficulty that would be experienced in gathering and threshing, it could not have been a factor in introducing agriculture to primitive man. He considers it more probable that the domesticators of such a wheat were already agricultural people, accustomed to the use of other seed plants for food and equipped with some primitive means of gathering and threshing as well as of grinding and cooking.

"Adaptations for cross-fertilization were found in the wild wheat and also indications of similar characters in the primitive unselected stocks of the domesticated wheat grown in the same part of Palestine. Some of the flowers have their anthers exerted before the shedding of the pollen, and, conversely, in some flowers the glumes spread apart so that pollen is admitted before the

anthers mature. The exertion of the stamens allows the pollen to be scattered by the wind. The spreading of the glumes permits wind-blown pollen to reach the stigmas. . . .

"Though the wild wheat of Palestine possesses all the characters that the European specialists expected to find in the primitive ancestor or prototype of the domesticated wheat, these characters might also be expected to occur in any wild relative of the wheat plant and do not afford ground for a final conclusion regarding the relationships that exist between the wild wheat of Palestine and the domesticated cereals.

"The economic value of this new wild relative of the cultivated wheats does not depend on its being the original progenitor or prototype. Its relationship is at least close enough to permit crossing or to justify an attempt at developing new types of cereals adapted to special conditions, such as those of our Southwestern States.

"The wild wheat of Palestine shows a wide range of individual diversity (heterism), like the wild relatives and unselected stocks of other domesticated plants. This condition of diversity is to be explained by the presence of specialized adaptations for cross-pollination, as well as by the absence of methodical selection. . . .

"The native wheat fields of Palestine produce excellent crops in spite of the fact that the individual plants show a wide range of differences, as bearded or beardless heads, very open or closely crowded spikelets, white, red, or black chaff, with smooth, pruinose, or velvety surfaces, dark or light grains, etc., from which an endless number of varieties could be separated by selection. The occurrence of this primitive diversity under conditions that admit of normal cross-fertilization indicates that the same method of acclimatization can be applied to wheat as to diverse types of cotton or other cross-fertilized crop plants. The full range of adaptation of a widely diversified type can be obtained, instead of the limited possibilities of self-fertilized strains selected on the basis of adaptation to entirely different conditions in northern Europe.

"Consideration should also be given to the possibility of securing increased rust resistance in wheat by the acclimatization of more vigorous cross-fertilized types or by using such types or the wild species to produce hybrids with American varieties. Cross-fertilized varieties of wheat would be subject to injury from wet weather at the time of flowing, but this danger would not be serious under the climatic conditions of the Southwestern States or of the Great Plains area.

"There is also the possibility of utilizing the wild wheat as a self-sown forage plant, either in cultivation or by allowing it to escape and establish itself on grazing lands in California or other Southwestern States. In view of the fact, however, that the seeds are specially adapted for dissemination the possibility of the plant escaping and becoming a weed will have to be carefully considered before any general distribution can be advised, even for experimental purposes."

Experiments in wheat breeding, E. G. MONTGOMERY (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 269, pp. 61, figs. 22*).—This consists of 2 papers in continuation of work previously noted (*E. S. R.*, 17, p. 552).

I. *Experimental error in the nursery and variation in nitrogen content* (pp. 9-32).—Determinations of the nitrogen content of wheat kernels from different plants show wide variations even when grown under apparently similar nursery or field conditions. Continued selection and planting by the centgener and row methods indicated that there was still a wide range in nitrogen content, and led to the conclusion that this character was not transmissible. These varia-

tions in nitrogen content were attributed therefore to variations in environment beyond the ordinary range of observation. The centgeners, rows, and small plats were found to vary almost as much as the individual plants, and the most practical way of overcoming this variation seemed to be by replicating the plats or rows a sufficient number of times to reduce the errors to less than one-half the real variation. To bring the experimental error within proper bounds most successfully, single plants should be replicated 40 or more times, 16 ft. rows from 5 to 10 times, and blocks 5.5 ft. square from 8 to 16 times.

In order to eliminate the undesirable strains, it was found that the experimental error should be less than one-half the real or expected variation. The easiest and most practical method found of growing strains to compare for the nitrogen content was to plant in rows from 12 to 16 ft. in length and repeat 10 times in different parts of the field. Several check plats should also be inserted.

Practically no relation was observed between the yield of grain and the nitrogen content, although there was a slight irregular tendency for the yield to increase as the nitrogen decreased. Tabulated data of nitrogen content and yields, and diagrams showing the results of different methods employed to reduce experimental errors, are given.

II. *Experimental error in the nursery and variation in yield* (pp. 33-61).—This paper deals with work performed chiefly in 1909 and 1910, the results of which are discussed with the idea of pointing out sources of error in connection with the centgener, row, and small plat method employed in cereal breeding and comparison of varieties, which seem to be due to unexpected variations in soil and climate. Suggestions of methods of correction of these errors have been deduced from studies of many hundreds of plants of wheat and oats covering the effect of repetition in reducing errors. Tabulated data show comparison of yields, variations, and coefficients of variations.

It was found that when 14 or 16-ft. row plats were used as checks or sown in duplicate, there was great variation in yield, owing to natural unequal effects of the environment. When the row plats were repeated 5 or 6 times, the extreme error was still large, owing to the chance combination of high or low variants. Systematic repetition constantly reduced error as the number of repetitions increased, but with 16-ft. row plats from 10 to 20 repetitions should be made, depending upon the degree of accuracy desired.

Small blocks, 5.5 ft. square, gave results similar to those of the row plats, except that the reduction of experimental error was somewhat greater as the result of repetition. Blocks repeated from 8 to 10 times gave results apparently about as accurate as rows repeated from 15 to 20 times. Increasing the size of the block, up to a certain limit, rapidly decreased variability; but error could not be indefinitely decreased by continuing to increase the size of the plat, as it could be by repetition. Variability was not constant from year to year on the same plats.

To alternate with check rows gave a high degree of accuracy, with a few extreme variations, when as high as 10 or more checks were used. The total number of plats required for the same degree of accuracy, however, was greater by this method than by systematic repetition. By increasing the length of the row or the size of the block, the number of repetitions necessary was decreased, but the total area required to secure the same accuracy was increased.

The rate of planting within certain wide limits had little influence on the yield. There was some competition between adjacent rows, especially when varieties very different in habit of growth were planted side by side. The use of blocks did away with this source of error.

Pure strains differed in a very marked way in most important characters. High yield in the field was associated with high yield in the nursery plats, and strong straw had a slight relation to size of plant but no relation to size of berry, and varied inversely with the percentage of nitrogen.

Block plats and row plats at the usual rates of seeding probably correlate more closely with results in field plats than in plats where the plants are spaced, as in centgeners. Where error is corrected by the system of repetition of plats, check plats should be used for the purpose of determining the experimental error. When the variation in checks equals the variation in strains, no possible selection can be made.

Seed tests made at the station during 1912, M. T. MUNN (*New York State Sta. Bul. 362, pp. 137-163*).—"In part 1 of this bulletin will be found, (1) a reprint of the law governing the inspection and sale of seeds, (2) a brief statement of the method employed in finding the percentages of impurity of the samples analyzed, (3) a table showing the percentage composition of about 125 samples collected under the law, after July 1, 1912, (4) results of some studies on the relationship between 'weight' and 'count' standards of purity, and (5) comments on the results of the inspection and the bearing of the law on agricultural interests. . . .

"Part 2 contains a brief report upon the seed trade conditions in this State, as revealed by the examination of 1,140 samples of seed received from correspondents during the calendar year 1912, consisting of 621 samples of alfalfa, 170 of red clover, 150 of timothy, 96 of alsike clover, and 47 miscellaneous samples.

"Thirteen samples of alfalfa seed had been adulterated, sand, crushed rock, broken seed, inert matter, and yellow trefoil seed being the adulterants used. Eighty-six per cent of the samples of hairy vetch had been adulterated with the seed of other vetches, notably spring vetch. Thirteen per cent of the alfalfa samples and 19 per cent of the red clover samples contained dodder seed, and the experience of farmers with this pest during the past season calls for a note of warning to prospective buyers. . . .

"The long list of foul and foreign seeds appears to be steadily increasing, mainly by the additional occurrence of new weeds. The most common impurities were plantain, mustard, green foxtail, chicory, and curled dock, with Russian thistle and roquette as new arrivals which attract much attention, but have so far proved to be of little importance in New York alfalfa fields. Examination of samples of alsike and timothy mixtures and of lawn grass mixtures revealed a very serious condition as regards purity. Such mixtures should be avoided."

Does the farmer get pure seeds? F. H. HALL (*New York State Sta. Bul. 362, popular ed., pp. 10, fig. 1*).—This is a popular edition of the above.

HORTICULTURE.

Proceedings of the Society for Horticultural Science, 1912 (*Proc. Soc. Hort. Sci., 1912, pp. 160, pls. 5*).—The following papers presented at the ninth annual meeting, Cleveland, Ohio, December 31, 1912, are here reported: The Injurious Effects of Lime on Some Small Fruits, by W. J. Wright; Forms of Sugar Found in Common Fruits, by F. Thompson and A. C. Whittier; A Uniform Fruit Score Card, by W. H. Alderman; An Analysis of Quality in Apples, by J. K. Shaw; Some Effects of Certain Commercial Fertilizers upon the Set of Fruit in the Peach, by C. A. McCue; Notes on Storing Apples, by J. H. Gourley; Field Studies of a Leaf Roll Disease of Potatoes, by C. L. Fitch; The Relation of Climate to Horticulture, by W. T. Macoun; The Demonstration

Orchard as a Factor in Horticultural Education, by R. W. Rees; Problems of Organization, by C. G. Woodbury; Suggestions Regarding the Teaching of Vegetable Gardening, by J. W. Lloyd; Report of Committee on Horticultural Courses, A. T. Erwin, C. S. Wilson, and C. G. Woodbury; Some Difficulties Involved in Testing Varieties of Potatoes and Tomatoes, by C. A. McCue and W. C. Pelton; Natural Resistance to Disease in Fruits, by U. P. Hedrick; Teaching Vegetable Gardening, by P. Work; The Vitality of Pollen, by C. S. Crandall; Some Notes on the Application of Science in European Horticulture, by W. R. Lazenby; Teaching and Learning in Horticulture, by T. V. Munson; Fumigating Greenhouses with Hydrocyanic Acid Gas, by R. Wellington; Winter Injury to Fruit Buds of the Apple and Pear, by O. B. Whipple; and The Ingredients in Lime-sulphur Injurious to Foliage, by V. I. Safran.

Horticultural work [at the San Antonio experiment farm in 1912], S. H. HASTINGS (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 120, pp. 14-17, figs. 2*).—This comprises a brief statement of the progress made in adaptation and variety tests of peaches, plums, persimmons, grapes, and ornamental trees and shrubs.

The woody plants of Kentucky, H. GARMAN (*Kentucky Sta. Bul. 169, pp. 3-62, pls. 10, figs. 8*).—A list of the woody plants of Kentucky showing the common and scientific names and distribution by counties, including some additional notes on the more important species. The list is regarded as preliminary to a more complete account of the woody plants of Kentucky.

Early cabbage, W. J. and S. N. GREEN (*Ohio Sta. Bul. 252, pp. 89-102, figs. 8*).—This report comprises descriptive notes and yield data on Wakefield strains of cabbage from 27 sources tested at the station during the seasons 1911 and 1912. Notes and data are also given on a number of miscellaneous types.

The authors are of the opinion that the experience of recent years has demonstrated the superiority of the Wakefield over the early types, as determined in the trials of 1888-89 (*E. S. R., 1, p. 293*).

Chili culture, E. R. ERDOZAIN (*Estac. Agr. Cent. [Mexico] Bol. 72, 1912, pp. 98, pls. 17*).—An account of various methods employed in growing chilies in Mexico.

An orchard survey of Dundas, Stormont, and Glengarry, F. S. REEVES (*Ontario Dept. Agr. Bul. 212, 1913, pp. 12*).—A study of the existing orchard conditions in three sections of Ontario, including cultural methods, methods of handling and marketing fruit, yields, income per acre, etc. Recommendations are also given relative to improvements in orcharding methods.

Apples, old and new, U. P. HEDRICK and G. H. HOWE (*New York State Sta. Bul. 361, pp. 79-135*).—This comprises a descriptive catalogue of 804 varieties of apples, the majority of which were described in *The Apples of New York* and in Bulletin 275 of the station (*E. S. R., 17, p. 1157*). Nearly all of these varieties are being or have been grown in the station orchard. In the present bulletin some changes have been made in the discussion of the old varieties and the station records of new varieties have been supplemented by information from originators and introducers. In the text which precedes the catalogue consideration is given to groups of apples, strains of apples, degeneration among apples, natural resistance to disease in apples, and seedless apples.

The authors conclude from the evidence at hand that the fruit grower is safe in assuming that for practical purposes varieties of apples do not degenerate. In connection with a discussion of resistance to disease, lists are given of varieties which were found to be more or less resistant or susceptible to apple scab and apple blight. A short bibliography on the subject of disease resistance is also given.

In the station tests of seedless apples none of commercial importance has thus far been observed. A list is given of growers of different varieties of seedless apples reported in the United States during the past 20 years, with the place of origin.

The best apples for New York State, F. H. HALL (*New York State Sta. Bul. 361, popular ed.*, pp. 12, fig. 1).—A popular edition of the above.

[Cultural experiments with apples] (*Field Expts. Harper-Adams. Agr. Col., and Staffordshire and Shropshire, Rpt. 1912, pp. 23-25, pls. 2*).—This is a progress report on some experiments started by the Harper-Adams Agricultural College in 1902 to determine the effect of pruning and of grass around fruit trees on the growth of the trees (*E. S. R.*, 26, p. 45). The results thus far indicate that both pruning and cultivation were important factors in stimulating tree growth.

The family apple orchard, W. J. GREEN (*Ohio Sta. Bul. 256, pp. 251-253*).—This comprises concise directions for the care and management of the home apple orchard.

[Cacao manurial plats in Dominica], H. A. TEMPANY (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Dominica, 1911-12, pp. 20-29, pl. 1*).—A progress report on the long continued fertilizer and mulching experiments with cacao at the botanic station (*E. S. R.*, 24, p. 545). As in previous years mulching has proved superior to any form of fertilizing. A complete fertilizer has given the next best results and all the fertilizer plats have yielded better than the no manure plat.

Mango culture in India, F. W. POPENOE (*Cuba Mag.*, 4 (1913), No. 8, pp. 356-361).—This comprises a brief statement of cultural methods and a partial list of important varieties of mangoes grown in India.

The grafted papaya as an annual fruit tree, D. FAIRCHILD and E. SIMMONDS (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 119, pp. 3-13, figs. 4*).—This paper reports the successful results secured by the junior author in cleft grafting the papaya (*Carica papaya*) at the Subtropical Plant Introduction Field Station, Miami, Fla., and discusses the possibilities of the grafted papaya.

The best success has been secured by grafting potted seedlings in the greenhouse or under the shade of a lath house where the stock can be kept in a good growing condition. Sprouts from topped stocks were used for scions. Somewhat extensive experiments will be conducted with papayas during the coming season. If plantations of grafted plants can be successfully established, growers will not only be assured of a practical method of rapid asexual propagation but it will also be possible to eliminate the relatively large number of male or sterile trees which usually occur when an orchard is started from seed. The possibility of grafting the papaya on a hardier species of *Carica* and thereby extending its region of growth is also suggested.

Garden design in theory and practice, MADELINE AGAR (*Philadelphia and London, 1912, pp. XV+272, pls. 6, figs. 110*).—A popular treatise on garden design which discusses the history and description of styles, considerations preliminary to designing the garden, preparation of the design, structural operations, the component parts of a garden, arrangement of plant material, and final considerations.

Commercial arsenates of lead and lime-sulphur, R. W. THATCHER (*Washington Sta. Popular Bul. 51, pp. 4*).—Analyses of several commercial brands of lead arsenate and lime-sulphur are reported, and the author also calls attention to the possible spray injury from acid arsenates if mixed with lime-sulphur to form a combined spray.

Spraying calendar for 1913, A. L. MELANDER and H. B. HUMPHREY (*Washington Sta. Popular Bul. 52, folio*).—Brief descriptions are given of the more

important pests and diseases of the apple, pear, peach, plum, cherry, etc., together with directions for their control and the preparation of spray mixtures.

FORESTRY.

Michigan trees.—A handbook of the native and most important introduced species, C. H. OTIS (*Univ. Bul. [Mich.], n. ser., 14 (1913), No. 16, pp. XXXVII+246, pl. 1, figs. 623*).—A popular guide to the trees of Michigan, the distinctive feature of which consists of keys which use both summer and winter characters as a basis for identification.

Note on tapping of *Boswellia serrata* trees in the Siwalik Division, United Provinces, R. S. PEARSON (*Indian Forester, 39 (1913), No. 4, pp. 196-199*).—Experimental data on the extraction of gum resin from *B. serrata* trees are given and discussed.

Investigations on the production of poplar wood and on the extension of the industry (*Bul. Mens. Off. Renseig. Agr. [Paris], 12 (1913), No. 3, pp. 273-296*).—This comprises a survey of the production of poplar wood in various departments of France.

Mechanical properties of western larch, O. P. M. GOSS (*U. S. Dept. Agr., Forest Serv. Bul. 122, pp. 45, pls. 6, figs. 12*).—In continuation of previous investigations of structural timbers (E. S. R., 28, p. 544), results are given of a series of tests to determine the mechanical and physical properties of western larch, and the various structural uses of the wood are described.

Bridge stringers and car sills containing defects commonly found in timber purchased on the market were tested to secure strength values for use in design, to determine the influence of seasoning and of defects on strength, and to compare the efficiency of grading rules and specifications. Small, clear, straight-grained pieces cut from the uninjured portions of the large beams were tested to determine the effect on strength of rate of growth, weight, and moisture. The results of the various tests are tabulated and discussed.

The composite type on the Apache National Forest, H. H. GREENAMYRE (*U. S. Dept. Agr., Forest Serv. Bul. 125, pp. 32, figs. 4*).—The study of the above type, the results of which are given in this bulletin, was made in order that a plan of management for it could be included in the working plan for the forest. The type is discussed with reference to its extent and composition, probable history, average stand, economic importance, and future composition. Diameter, height, and volume tables are given for western yellow pine, Douglas fir, and blue spruce, together with comparative form factors and increment, and the comparative growth of western yellow pine in pure and in composite stands. Data are also given showing the effect of cutting on three different reproduction plats.

A plan of management for the composite type is discussed under the following general headings: Method of cutting, rotation, brush disposal, fire, and grazing.

Forestation of the sand hills of Nebraska and Kansas, C. G. BATES and R. G. PIERCE (*U. S. Dept. Agr., Forest Serv. Bul. 121, pp. 49, pls. 13, fig. 1*).—This comprises an account of the work accomplished, principally by the Forest Service, in forestation of the sand hills of Nebraska and Kansas. Both nursery and field planting operations are described in detail with the view of pointing out to planters the mistakes and successes which have been attained by using different methods.

Jack pine and western yellow pine have been the 2 principal species employed in the Nebraska sand hills. In addition to these, various hardwood species have been used in the Kansas plantings. The species of trees found to be the most

resistant to the extreme drought in 1911 were green ash, yellow pine, honey locust, and red cedar.

Summing up the work of sand hill planting as a whole, it appears that the use of well-grown and seasoned nursery transplants, together with planting as early in the spring as possible will result in a relatively high percentage of success in the field.

California Redwood Park, A. A. TAYLOR (*Sacramento, Cal., 1912, pp. 130, pl. 1, figs. 13*).—A historical, descriptive account.

Progress report of forest administration in Baluchistan for 1911-12, MULRAJ and H. DOBBS (*Rpt. Forest Admin. Baluchistan, 1911-12, pp. III+36*).—This is the usual progress report relative to the constitution, management, and administration of the state forests in Baluchistan, including a financial statement for the year 1911-12. The more important data relative to alterations in area, forest surveys, working plans, yield in forest products, revenues, expenditures, etc., are appended in tabular form. The report is reviewed by the revenue commissioner.

The seed test in word and picture, BUSSE (*Ztschr. Forst. u. Jagdw., 45 (1913), No. 3, pp. 174-185, fig. 1*).—A review with supplementary notes of Haack's extensive experiments on the testing of pine seeds (*E. S. R., 27, p. 243*).

Effect of forest fires on standing hardwood timber, W. H. LONG (*U. S. Dept. Agr., Forest Serv. Circ. 216, pp. 6*).—A discussion of some of the direct and immediate injurious effects of light fires in a forest, based on a study of forest conditions in the Ozark Mountains of Arkansas. Special attention is called to the damage to merchantable timber evidenced by fire scars which afford an entrance for destructive worms and rots.

Pith-ray flecks in wood, H. P. BROWN (*U. S. Dept. Agr., Forest Serv. Circ. 215, pp. 15, pls. 6*).—This comprises a study of the cause and occurrence of pith-ray flecks in wood, including a review of the literature on the subject. The subject matter is discussed under the general headings of previous investigations, origin of pith flecks, occlusion of the larval passages, groups and species of trees affected, geographic distribution of the cambium miner, factors affecting local distribution of larvæ and passages, taxonomic value of pith flecks, and deteriorative effect on quality of wood. A bibliography is appended.

The author's investigation confirms the conclusions of Kienitz,^a an earlier investigator, that pith flecks are caused by the larva of a dipterous insect living in the cambium during the growing season. Since pith flecks are clearly of pathologic origin and their distribution in genera, species, and individuals is extremely irregular and uncertain, they do not have the taxonomic value attributed to them by some earlier writers on wood.

Pith flecks may mar the natural beauty of the wood by causing discoloration and in some woods they cause definite areas of disintegration in which normal tissues become involved.

DISEASES OF PLANTS.

The consideration of meteorological conditions in reports on plant protection from the principal stations for plant diseases, R. SCHANDER (*Jahresber. Ver. Angew. Bot., 9 (1911), pp. 1-22*).—From an examination of crop and price statistics regarding wheat and potatoes and of the records of weather and plant diseases for several years, the author concludes that fuller and more exact knowledge of the relations existing between these two factors is highly desirable, as is also a closer collaboration between the organizations for plant protection and the meteorological institutions.

^a Bot. Centbl., 14 (1883), pp. 21-26, 56-61.

Examples of disease control in practical operations, R. SCHANDER (*Jahresber. Ver. Angew. Bot.*, 9 (1911), pp. 26-38).—This is an account of work done in exposition of methods of combating diseases and pests affecting fruit trees, the American gooseberry mildew, etc., with a view to encouraging the wider adoption and use of such methods. The important practical difficulties in the employment of the hot-water treatment for loose smut of wheat are said to limit greatly its practicability.

Report of the pathologist, J. R. JOHNSTON (*Porto Rico Sugar Producers' Sta. Rpt. 1912*, pp. 23-28).—The work of the pathologist was continued along the lines suggested in his first report (*E. S. R.*, 26, p. 143), being confined in the main to diseases of the sugar cane.

Of the sugar cane diseases in Porto Rico those caused by root fungi are said to be the most common and destructive. There are two main types of root diseases, one characterized by the tight binding of the leaf sheaths, and the other by the branching, white mycelium.

The rind disease occurs in Porto Rico and appears to have a close relation to the climatic conditions and to the presence of the moth stalk borer.

The use of Bordeaux mixture for treating seed cane has been recommended, and the author calls attention to the fact that in times of drought the treatment is of unquestionable value, while in a good germinating season it may show little effect other than hastening germination.

A disease due to *Cercospora vaginæ*, causing the red rot of the leaf sheath, was investigated, and experiments were carried on to determine the effect of the disease on the growing of young cane. Shoots from two lots of cuttings, one diseased and the other apparently free from disease, were examined, and, absolutely no difference could be detected in the two lots.

A new disease is said to have made its appearance, which so far has been limited to the variety known as D 117. It is characterized by the appearance of withered tips or dry, brown areas on the leaf blade. Several fungi have been found on the dead or dying parts of the cane leaves, but they are not believed to be strictly parasitic.

The author, in cooperation with the chemist of the federal station at Mayaguez, is investigating a form of chlorosis of cane, particularly in regard to the presence of various fungi.

The report concludes with a brief account of laboratory experiments and cultures of a number of fungi known to attack the sugar cane.

Report of the Union plant pathologist and mycologist for 1911, I. B. P. EVANS (*Union So. Africa Dept. Agr. Rpt. 1910-11*, pp. 257-266, pls. 19).—During the period covered by this report the investigations consisted largely of studies on the fungus flora of South Africa, a bacterial disease of mangoes, brown rust of maize, a fungus disease of bagworms, crown gall of plants, silver leaf of stone fruits, and fungi on wattle and wattle timber, together with experiments for their control.

The bacterial disease of mangoes is said to have been reported from a number of localities, and all parts of the tree seem to be subject to attack. Upon the leaves small, dark, angular spots are formed, and on the stems discolored areas, accompanied by longitudinal cracks, are found. The peduncles and pedicels are affected to such an extent that they become dark and the fruit becomes detached and falls to the ground. A bacillus has been isolated from infected tissues and the disease reproduced by means of inoculation experiments. Spraying has up to the present not proved of any use in combating this trouble.

In a study of the brown rust of maize (*Puccinia maydis*), the author confirms other observations, showing that the fungus on maize is associated with

the æcidium on *Oxalis corniculata*. The relation of Puccinia to other species of *Oxalis* is being investigated.

A brief account is given of investigations of a fungus parasite of bagworms which has been found quite efficient in destroying these pests. The use of this fungus, to which the name *Isaria psychidæ* n. sp. is given, is said to be complicated by the fact that it is heavily parasitized by another fungus, *Melanospora parasitica*.

The author reports some experiments on the crown gall due to the organism *Bacterium tumefaciens*, and states that this organism caused considerable damage in South Africa, especially to peach, apricot, and apple trees. The willow is also very subject to attack and is held in some measure to be responsible for the dissemination of the disease throughout the country.

The silver leaf of stone fruit trees described is characterized by a silvering of the foliage of apricot, peach, and plum trees. Careful investigations which have been repeated a number of times have in no case shown the presence of the fungus *Stereum purpureum*, which is usually held to be the cause of this disease.

Notes on some diseases and enemies of cultivated plants in the far East, I. L. DUPONT (*Bul. Écon. Indochine, n. ser.*, 15 (1912), No. 99, pp. 781-803).—Following a preliminary account of the attack of fungi on plants, the author notes the occurrence of and briefly describes a number of fungus parasites on field, orchard, garden, and other plants. The arrangement is by host plants, and the species known to occur in Indo China are definitely indicated, while others reported as having been observed in this or contiguous regions are also noted.

Report on plant diseases, 1910-11. G. P. DARNELL-SMITH (*N. S. Wales Rpt. Govt. Bur. Microbiol.*, 2 (1910-11), pp. 168-172).—Notes are given on diseases observed on a large number of economic plants, together with descriptions, and in some instances suggestions are made regarding methods of treatment.

Contributions on the Ustilagineæ, F. RAWITSCHER (*Ztschr. Bot.*, 4 (1912), No. 10, pp. 673-706, pl. 1, figs. 20).—This is an account of the author's investigations regarding the behavior of cells and nuclei during the development of *Ustilago tragopogonis*, *U. maydis*, and *U. carbo* in their respective hosts, yellow goats beard, corn, and oats. See also a previous note by Lutman (*E. S. R.*, 26, p. 341).

A contribution on the dry spot of cereals, KUHNERT (*Deut. Landw. Presse*, 40 (1913), No. 8, pp. 84-86).—The author carried out experiments testing the conclusions arrived at by Clausen (*E. S. R.*, 24, p. 449), that dry spot of oats with resulting loss in crop returns is due to improper proportioning and application of chemical fertilizers, particularly lime. The fertilizers applied were Thomas slag 600 kg. per hectare (534 lbs. per acre), kainit 600 kg., nitrate of soda 150 kg., ammonium sulphate 125 kg., superphosphate 450 kg., and lime 3,000 kg.

The largest increase in yield of grain over the unfertilized control, 1,960 kg. per hectare, was obtained by the use of Thomas slag, kainit, nitrate of soda, and lime. From the results obtained with the various combinations tried, it is concluded that the addition of lime in the quantity employed makes comparatively little difference in yield, but that the effects of dry spot may be materially lessened by a more careful adaptation of artificial fertilizers.

A leaf spot of cereals, F. KRAUSE (*Jahresber. Ver. Angew. Bot.*, 9 (1911), pp. 103-116).—The author investigated a case of leaf spot occurring on lighter soils in restricted areas of the province of Posen, attacking in order of severity oats, wheat, rye, and barley, also with considerable variation as to symptoms and severity, flax, horse beans, sugar beets, carrots, and potatoes. It is con-

sidered probable that nematodes are responsible for the injury, but the investigations are still in progress.

Contributions on the biology of the *Fusaria* of cereals, E. SCHAFFNIT (*Jahresber. Ver. Angew. Bot.*, 9 (1911), pp. 39-51).—This is a study of snow mold wintering over in cereals, attributed by Sorauer (E. S. R., 14, p. 263) to *Fusarium nivale*, which is claimed by Ihssen (E. S. R., 23, p. 545) to be identical with *Nectria graminicola*. The author considers *F. nivale* to be only one of several fungi comprehended under the term snow mold. Detailed comparisons with closely related species of *Fusarium* are given.

Apparatus for control of smut, E. RIEHM (*Deut. Landw. Presse*, 40 (1913), No. 10, pp. 107, 108, figs. 3).—The author gives brief discussions of several forms of apparatus for the employment of heat in combating grain smuts. See also a previous note (E. S. R., 26, p. 546).

Leaf cut, or tomosis, a disorder of cotton seedlings, O. F. COOK (*U. S. Dept. Agr., Bur. Plant Indus. Circ.* 120, pp. 29-34, fig. 1).—Leaf cut is a name suggested for a disease of the leaves of cotton to distinguish it from leaf curl, which is induced by plant lice. Leaf cut is said to be widely distributed and familiar to planters, although generally confused with leaf curl. It is in the nature of an environmental injury and is not due to parasitic organisms or to constitutional weakness, but is sometimes connected with exposure to heat and dryness. All varieties of cotton seem to be susceptible to this trouble during the early stages of growth.

Though leaf cut is not fatal, it is believed to be responsible for much damage by retarding the growth of the young plants. Often the terminal buds are destroyed, and this interferes with the normal branching and the plants are permanently deformed. Damage from this cause can be avoided or reduced by improved cultural methods, and the deformed plants may be removed in late thinning.

A dry rot of the Irish potato tuber, E. M. WILCOX (*Abs. in Science, n. ser.*, 37 (1913), No. 949, p. 386).—The author gives a preliminary report on a disease of potatoes observed in 1908 in western Nebraska which has been investigated and determined as due to *Fusarium tuberivorum*. For a further account of this disease see below.

A dry rot of the Irish potato tuber, E. M. WILCOX, G. K. K. LINK, and VENUS W. POOL (*Nebraska Sta. Research Bul.* 1, pp. 88, pls. 28, figs. 23).—The authors give a detailed report of investigations of a dry rot of the Irish potato tuber which appears to affect the mature tubers only. The rotting is rather slow, but within 4 to 6 weeks from one-third to three-fourths of the tuber is destroyed. The disease may make its appearance at any point on the surface of the tuber, though most commonly it appears at the bud end. There is no watery degeneration of the tuber unless other organisms gain entrance, so that it is a true dry rot.

The trouble is caused by the attack of a species of *Fusarium*, to which the authors give the name *Fusarium tuberivorum* n. sp. The morphology of the causal organism and the etiology of the disease are described at considerable length.

Marked differences in susceptibility were noted for different varieties of potatoes. Inoculation experiments failed where the epidermis was uninjured.

In experiments for the control of the disease, tubers were treated with different fungicides prior to storage, lime sulphur, formalin solution, and formalin vapor giving the best results.

Summarizing their report, the authors state that the dry rot of the Irish potato tuber is primarily confined to the mature tubers, and that the disease is of great economic importance through the serious destruction of the tubers

while in winter storage. The fungus is incapable of infecting any other part of the potato plant than the tuber, and it can not invade the tuber until it is practically mature and then only through wounds. During the winter season the tubers are more rapidly destroyed by this dry rot than at harvest time. The possible loss due to this trouble may be greatly reduced by treatment with fungicides.

A bibliography of the subject is given.

A dry rot of the Irish potato tuber, E. M. WILCOX and G. K. K. LINK (*Nebraska Sta. Bul. 134*, pp. 8, pls. 3, fig. 1).—This is a popular edition of the above.

A biochemical study of the curly top of sugar beets, H. H. BUNZEL (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 277*, pp. 28).—In this paper the author summarizes the results of experiments on the application of the manometric method to a study of the curly top of sugar beets, a preliminary note of which has been given elsewhere (*E. S. R.*, 26, p. 848). This trouble has been attributed to many causes, among them atmospheric conditions, micro-organisms, insects, irrigation, etc.

In 1911 the author carried on experiments to determine the oxidase content of healthy and diseased sugar beets grown in the greenhouse. The results seemed to be quite conclusive in showing differences in the oxidase content of the healthy and diseased sugar beets, and later the work was carried on in the field, where the greenhouse results were corroborated.

The leaves of the curly-top plants were found to have an oxidase content 2 or 3 times as great as the healthy and normally developed ones. No marked differences could be detected between the roots of the two kinds of plants, but an abnormally high oxidase content of the leaves was found in all plants the growth of which had been retarded from any cause.

The general conclusion is drawn from the observations that an abnormal retardation of growth in sugar beet plants is accompanied by an increase in the concentration of oxidases in the leaves, or a change in the juice of the latter by which the pyrogallol oxidizing oxidase becomes more active.

The control of the sugar beet leaf spot, VENUS W. POOL and M. B. MCKAY (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 121*, pp. 13-17).—An investigation of the leaf spot of the sugar beet, due to *Cercospora beticola*, has been carried on in cooperation with the American Beet-Sugar Company, and although the study is as yet incomplete, a brief account is given of some of the results, which indicate possible methods of control.

The fungus was found to live through the winter on the old beet tops of the preceding season, and the results thus far obtained indicate that the organism is unable to survive a passage through the alimentary tract of cattle, sheep, and pigs. As it is impossible to prevent some waste in feeding beet tops and subsequent infestation, it is recommended for the complete control of the disease that the beet tops be removed from the fields while still green and made into silage. The fungus is killed when the beet tops are siloed.

A new leaf spot of cucumbers in Saxony, A. NAUMANN (*Ztschr. Obst. u. Gartenbau*, 1912, No. 7, p. 99; *abs. in Ztschr. Landw. Versuchsw. Österr.*, 15 (1912), No. 12, p. 1305; *Bot. Centbl.*, 122 (1913), No. 13, p. 287).—A new disease of cucumbers, claimed to have been introduced on English seed, is described. It is said that steeping the seed in 0.5 per cent solution of formaldehyde for 15 minutes, or in 0.5 per cent copper sulphate for 20 hours with a wash of lime water afterwards, gives efficient protection.

Some diseases of garden plants and frost injuries of apples, A. NAUMANN (*Jahresber. Ver. Angew. Bot.*, 9 (1911), pp. 198-217, figs. 9).—The author gives an account of a spreading leaf gall of *Azalea indica* which was stopped by the

application of Tenax; one or more *Septoria* of undetermined species on the same plant; *Oidium ericinum* causing the mildew of *Erica gracilis*, also a rust on the same, said to be new and named *Uredo ericæ* n. sp.; a twig blight of *Camellia*, attributed to a *Myxosporium* of undetermined species; and certain frost injuries with recovery of apples, which are thought to bear important relations to precipitation, temperature, etc., before and after the freeze proper.

Injury to vegetation by oxalic compounds and the absorption of foul gases by grapes, F. MUTH (*Jahresber. Ver. Angew. Bot.*, 9 (1911), pp. 218-240, pl. 1, figs. 5).—In a case where trees, garden plants, and vineyards showed damage referred to emanations from adjoining chemical works, analyses of the powder deposited on the foliage showed that oxalic acid or its salts made up nearly one-third thereof, also that sodium compounds were present. Pot and field experiments demonstrated that the characteristic injuries may be produced by powdering the leaves, especially the lower sides, and the flowers, with talc containing even a small percentage of oxalic compounds, and in less degree and strictness by similar treatment with sodium hydroxid or carbonate. The hydrogen ion, in case of oxalic acid, seemed to be the primary injurious agent and the negative ion of secondary importance, as the injury was less for the acid salt than for the acid and still less for the neutral salt. The oxalic compounds dissolved in the soil water appeared to be without injurious effect, supposedly on account of the lime present in the soil. The abnormal taste of the wine from the grapes grown in the neighborhood was attributed to their absorption of the foul gases permeating the air of the vicinity.

A twig disease of fruit trees due to bacteria, A. OSTERWALDER (*Schweiz. Ztschr. Obst u. Weinbau*, 1912, pp. 197-200; *abs. in Ztschr. Landw. Versuchsw. Österr.*, 15 (1912), No. 12, p. 1303).—The author states that a drying of floral leaves and twigs on fruit trees, which recently appeared in Wädenswil, is due to *Bacillus amylovorus*.

Notes on three limb diseases of apple, G. W. WILSON (*North Carolina Sta. Rpt.* 1912, pp. 47-55, figs. 6).—Descriptive notes are given on the New York canker due to *Sphaeropsis malorum*, European canker caused by *Nectria ditissima*, and a disease of apple twigs the cause of which has previously been referred to the genus *Thelephora*, but which is now reported as being due to *Septobasidium pedicellatum*. The different fungi causing these diseases are described, their distribution indicated, and preventive treatment suggested. The treatment consists of cutting out the diseased portions and spraying with some good fungicide.

Infection of apple leaves by cedar rust, H. R. FULTON (*North Carolina Sta. Rpt.* 1912, pp. 62-66).—A report is given of experiments on a considerable number of varieties of apples to determine the possibility of inoculating leaves with cedar rust spores sprayed upon them at different times in the spring. Inoculations were made almost daily from March 26 to May 7, and decided differences in susceptibility of varieties were noted. Two periods of artificial infection were observed, about April 1 and April 21, the spots indicating the presence of the fungus being noticed about 10 days after the inoculation dates mentioned.

The experiments carried on during the season of 1912 showed that the teleuto-spores of the fungus were capable of germination for about six weeks, but that they formed infection spores abundantly only when there was continuous wet weather for about two days. The infection of apple leaves was produced by these spores only when the wet weather was more prolonged, giving a chance for germination after distribution of the spores. Only a portion of the leaves on any twig were found to have been infected at any one time, and the susceptibility of the leaves was determined by their age.

A tentative plan for spraying for the prevention of the rust is proposed, in which applications of fungicides are to be made (1) just after the leaves emerge from the bud, (2) just before the blossoms open, (3) just after the petals fall, and (4) 10 days later. Only decidedly susceptible varieties need be treated for protection.

Rust of pear trees, A. OSTERWALDER (*Schweiz. Ztschr. Obst u. Weinbau*, 1912, p. 311; *abs. in Ztschr. Landw. Versuchsw. Österr.*, 15 (1912), No. 12, p. 1303).—As a means of controlling this disease, the author emphasizes the destruction of the neighboring junipers, which are said to be indispensable to the complete development of the fungus.

The Monilia disease of quinces (*Monilia linhartiana*), PIEPER (*Ztschr. Obst u. Gartenbau*, 1912, p. 87; *abs. in Ztschr. Landw. Versuchsw. Österr.*, 15 (1912), No. 12, p. 1305).—This is a report on an attack by *M. linhartiana* on quinces in Lössnitz. The use of sulphur as a fungicide is recommended.

Rusts of blackberries, dewberries, and raspberries, G. W. WILSON (*North Carolina Sta. Rpt.* 1912, pp. 56–61, figs. 4).—The author gives descriptions of the orange rust (*Gymnoconia interstitialis*), late rust (*Kuehneola albida*), and cane rust (*Uredo muellerii*), with suggestions for their control, so far as definite means are known.

Observations on control of American gooseberry mildew, BIERMANN (*Geisenh. Mitt. Obst u. Gartenbau*, 1912, p. 60; *abs. in Ztschr. Landw. Versuchsw. Österr.*, 15 (1912), No. 12, p. 1306).—It is stated in a report on the appearance of American gooseberry mildew in the district of St. Goarshausen that the American gooseberry proved fully resistant to this disease. Prescribed measures for protection included destruction of all affected parts, deep turning of the soil, and avoidance of infected stock.

The control of downy mildew in 1912, L. SAURET (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 8, pp. 231–237).—The author reports the successful treatment of vineyards to protect them against the downy mildew in 1912. Following the suggestions of Capus (*E. S. R.*, 25, p. 550), advantage was taken of weather conditions and the vines sprayed with a copper fungicide containing 2 kg. of copper sulphate to 1 of lime or carbonate of soda. Five applications were made between April 15 and June 29, followed by three supplemental sprayings in July and August. As a result a good harvest of grapes was secured.

The author thinks more attention should be paid in spraying to the condition of the vines, the precipitation, and the temperature at critical periods.

Causes of failure in treating vines for mildew in 1912, J. B. CASTELLI (*Petite Rev. Agr. et Hort.*, 19 (1913), No. 437, p. 38).—The downy mildew (*Plasmopara viticola*) is said to have been very destructive in 1912 in vineyards in Aude and Pyrénées-Orientales, where from 3 to 5 sprayings were given the vines. Analyzing the conditions that prevailed, the author believes that the failure was due to the application of the fungicides without reference to weather and temperature conditions as well as to faulty spraying. The leaves and young grapes were not protected at the periods of greatest liability to infection.

A study of the disease produced by *Rhizoctonia violacea*, J. ERIKSSON (*Rev. Gén. Bot.*, 25 (1913), No. 298, pp. 14–30, figs. 4).—The author describes diseases of a number of economic plants due to the fungus *R. violacea*, and considers as to whether there may not be specialized forms of this fungus.

Among the plants subject to attack are carrots, beets, clover, etc., and inoculation experiments made with *Rhizoctonia* taken from beets produced disease on turnips, carrots, and beets, but not on clover. Other investigations seem to indicate that there are probably rather definitely developed races of this

fungus. The spore-bearing form of the fungus has been found on a number of species of plants quite different from the ones containing Rhizoctonia. The author has described the spore-bearing form as *Hypochnus violaceus*. The form specialized upon carrots produces its *Hypochnus* stage on the stems of *Stellaria media*, *Myosotis arvensis*, *Galeopsis tetrahit*, *Erysimum cheiranthoides*, *Urtica dioica*, and *Sonchus arvensis*.

For the control of the Rhizoctonia on carrots and beets, all infected plants should be removed from the fields before planting, disinfection of seed should be followed as far as possible, examination made of the stored roots during the winter and all diseased ones destroyed, and long rotations, 4 years or more, practiced, so that the ground will not be occupied by plants subject to attacks of this fungus. The use of fresh fertilizers, particularly animal fertilizers, is strongly condemned.

*A note on the possible occurrence of a bacterial disease of Hevea, E. BATESON (*Agr. Bul. Fed. Malay States*, 1 (1913), No. 7, pp. 268-270).—In examining a number of diseased rubber trees a specimen was found which did not seem to be infected with any of the common root or stem diseases. The wood of this tree was discolored to a depth of about 1 in., the outer portions being dark brown. The manager of the estate from which the tree was obtained stated that the leaves on the lower branches died suddenly, as though they had been scorched by fire. This condition spread rapidly, and within three days all the leaves on the tree were dead.

An examination of the tissues showed the presence of abundant bacteria embedded in a mucilaginous substance. Cultures were readily made and experiments carried out to determine whether the organism in question produced the disease or not. Thus far the inoculation experiments have given negative results, but the author does not consider this direct evidence that the death of the tree was not due to bacteria.

On *Sphaerella macularis*, G. B. TRAVERSO (*Atti Accad. Sci. Veneto-Trentino-Istriana*, 3. ser., 5 (1912), No. 1-2, pp. 14-23; *abs. in Mycol. Centbl.*, 2 (1913), No. 2, p. 116).—The author states that a fungus growth on leaves of *Populus tremula*, hitherto called *S. macularis*, is in reality composed of two fungi, which are described under the names *S. tremulicola* and *Phæosphaerella macularis*.

A witches' broom on sycamore maple, H. SOLEREDEB (*Sitzber. Phys. Med. Soz. Erlangen*, 43 (1911), pp. 239, 240, fig. 1; *abs. in Mycol. Centbl.*, 2 (1913), No. 2, p. 105).—The author reports the existence of a bushy witches' broom on the main trunk of a maple (*Acer pseudoplatanus*) in Erlangen. Investigations for several years have failed to show any fungus in casual association with the growth.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Some Ohio birds, H. A. GOSSARD and S. G. HARRY (*Ohio Sta. Bul.* 250, pp. 78, pl. 1, figs. 18).—A discussion of the more important Ohio birds, particularly as relates to their economic status. A list with notes on the occurrence of 100 birds in Wayne County and in the State is appended, as is also a list of useful publications on birds.

The Lewis woodpecker, a destroyer of almonds, H. C. BRYANT (*Mo. Bul. Com. Hort. Cal.*, 1 (1912), No. 8, pp. 362-366, figs. 2).—The Lewis woodpecker (*Asyndesmus lewisi*), by nature a high mountain bird, is reported to have been unusually abundant in the Capay Valley, Cal., and to have caused considerable injury to almonds, one grower reporting a loss of 10 per cent of his crop. In stomach examinations of 5 woodpeckers taken in an almond orchard at Guinda over 65 per cent of the food eaten was made up of small pieces of almonds, with

an additional 16 per cent of vegetable matter which could not be definitely determined as almond meats. The animal food, amounting to 15 per cent, was made up of beetles and ants.

Mention is made of the California blue jay as being by far the worst pest of the almond orchard.

The economic value of the western meadow lark in California, H. C. BRYANT (*California Sta. Bul.* 236, pp. 16, figs. 7).—A report based upon the investigations previously noted from other sources (E. S. R., 28, pp. 155, 351).

The instinct of insects, J. H. FABRE (*Les Merveilles de l'Instinct chez les Insectes*. Paris, 1913, pp. 265, pls. 16, fig. 1).—A popular account.

The poison exponent: A symbol of the toxicity of chemicals in their relation to insects, T. E. HOLLOWAY (*Jour. Econ. Ent.*, 5 (1912), No. 6, pp. 452-456).—The author's studies have led him to formulate the following law:

"If the length of life of a poisoned insect may be taken to indicate the toxic value of the chemical to which that insect is subjected, then the toxic values of two chemicals vary inversely with the lengths of life of two insects respectively subjected to them, assuming that the insects are of the same species and at the same period of their life cycle, and that environmental conditions are equal."

[Report of the] division of entomology, Z. P. METCALF (*North Carolina Sta. Rpt.* 1912, pp. 31-33).—Work with the grass billbug (*Sphenophorus parvulus*) indicates that a partial second generation usually occurs in the vicinity of West Raleigh. Notes are also presented on other pests of the year.

Report of the entomologist, D. L. VAN DINE (*Porto Rico Sugar Producers' Sta. Rpt.* 1912, pp. 15-22).—A brief report of the work of the year with insect enemies of sugar cane, including accounts of their occurrence and injury.

During the year the West Indian sugar-cane leafhopper (*Delphax saccharivora*) was discovered breeding on cane in Porto Rico. Observations made of its life history show the eggs to be deposited in or along the midrib of the leaf, being usually inserted from the underside of the leaf. Several eggs, varying in number from 3 to 11, are inserted in a single chamber and occur in a row on end at right angles to the long axis of the leaf. After the eggs are inserted therein, the opening of the egg chamber is covered by a white, cottony, wax-like secretion, the egg clusters being easily located by this conspicuous white covering. The young and adult leafhoppers occur upon the cane leaves and feed upon the juice of the plant. The injury to the plant consists not only in their absorption of the juice, but in the rupture of the tissues of the plant by their punctures, allowing excessive evaporation and the entrance of pathogenic fungi. An egg parasite belonging to the family Mymaridae was bred in some numbers.

A brief account is given of work with the sugar-cane borer (*Diatraea saccharalis*), a circular relating to which has been previously noted (E. S. R., 27, p. 659). A tachinid of the genus *Hypostena*, probably new to science, is said to have been reared from its tunnel in the cane.

The fungus parasite *Cordyceps barberi* is found infesting the larva of the moth-borer in all of the districts on the island but in no great amount in any locality. The parasitic fungus *Metarrhizium anisopliae*, introduced from Hawaii, has been found to attack both the larva and adult of the May beetle (*Lachnosterna* sp.) in the experimental cages. Mention is made of the discovery of a tachinid parasite of the May beetle, a description of which by W. R. Walton under the name *Cryptomcigenia aurifacies* has been previously noted (E. S. R., 28, p. 657). The other insects discussed are the mole cricket, or "La Changa" (*Scateriscus didactylus*), sugar-cane mealy bug (*Pseudococcus sacchari*), the weevil stalk borer (*Metamasius hemipterus*), which has been found to be at-

tacked by the fungus *Metarrhizium anisopliæ*, the shot hole stalk borer (*Xyleborus* sp.), the weevil root borer, *Targonia sacchari*, *Laphygma frugiperda*, *Diabrotica graminea*, *Tettigonia similis*, etc.

Report of the superintendent of entomology, E. M. EHRHORN ([*Bien.*] *Rpt. Bd. Comrs. Agr. and Forestry Hawaii*, 1911-12, pp. 101-151).—This report presents the results of inspection work, and discusses fruit fly control, work with the horn fly parasite, etc.

Field observations on sugar-cane insects in the United States in 1912, T. E. HOLLOWAY (*U. S. Dept. Agr., Bur. Ent. Circ. 171*, pp. 8).—This paper is based on records of field observations made during a survey of the sugar cane areas of Louisiana and Texas, supplemented by observations in Mississippi and Alabama.

Examinations made indicate that the infestation of the sugar-cane moth borer varies from 99 per cent at a point in the Rio Grande Valley in Texas to no infestation at places in northern Louisiana, Alabama, and Mississippi, and even at Sugar Land and Victoria, Tex. During the course of the survey the eggs of the moth borer were found for the first time in this country to be attacked by the hymenopterous parasite *Trichogramma minutum* (*pretiosa*), first at Audubon Park, New Orleans, and later at Donaldsonville and Franklin, La., and Brownsville and Donna, Tex.

Cane at the experimental grounds at Brownsville, Tex., which was found to be infested by the sugar-cane mealy bug (*Pseudococcus calceolariaæ*), was destroyed in an attempt to eradicate the pest from that locality.

Brief notes are given on the sugar-cane weevil borer, the fall army worm (*Laphygma frugiperda*), the sugar-cane beetle, the sugar-cane aphidid, ants, leafhoppers, froghoppers, termites, and grasshoppers.

Enemies of the coconut palm, F. ZACHER (*Tropenpflanzer*, 16 (1912), No. 9, pp. 484-493, figs. 14; abs. in *Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 11, pp. 2541, 2542).—Notes are presented on a number of insect enemies of the coconut palm not mentioned by Froggatt (E. S. R., 26, p. 60), who has conducted investigations of those of the Solomon Islands, or by Gehrman (E. S. R., 26, p. 151) in the Samoa Islands.

Notes on insect destruction of fire-killed timber in the Black Hills of South Dakota, P. L. BUTTERICK (*Jour. Econ. Ent.*, 5 (1912), No. 6, pp. 456-464, figs. 3).—The author outlines the results of the work of insects following forest fires in the Black Hills of South Dakota and suggests remedies for their depredations.

Distribution and species forming of ectoparasites, V. L. KELLOGG (*Amer. Nat.*, 47 (1913), No. 555, pp. 129-158).—A discussion of the significance of distribution and species forming among the Mallophaga or bird biting lice.

The 1912 chinch bug campaign in Illinois, S. A. FORBES (*Urbana, Ill.: State Ent.*, 1912, pp. 17, figs. 8).—A detailed report of the work carried on in combating the chinch bug in 1912.

Preliminary list of the scale insects of South Carolina with some notes on the behavior of *Lecanium quercifex*, W. P. GEE (*Jour. Econ. Ent.*, 5 (1912), No. 6, pp. 484-486).—Twenty-six species are listed as occurring in South Carolina.

The San José scale in Tennessee with methods for its control, G. M. BENTLEY (*Tennessee Sta. Bul.* 98, pp. 39-59, figs. 21).—A discussion of the occurrence of the San José scale in Tennessee, its life history and habits, natural enemies, and remedial measures.

Spraying for white flies in Florida, W. W. YOTHERS (*U. S. Dept. Agr., Bur. Ent. Circ.* 168, pp. 8).—Emulsions of various heavy mineral oils have been found to give the best satisfaction as sprays for use in combating the white-fly

enemies of citrus. While petroleum fuel oil, or crude oil, and distillate, or gas oil, will give good results, yet the paraffin or lubricating oils, having a specific gravity of from 24 to 28° B. have been found to possess certain qualities which make them superior bases for an insecticide. A formula consisting of whale-oil soap 8 lbs., paraffin oil (24 or 28° B.) 2 gal., and water 1 gal. is said to have given highly satisfactory results, when used at a dilution of 1 gal. to 50 gal. of water. This emulsion when used with 1 per cent of oil will kill the rust mite and its eggs and also the purple scale. The experiments thus far conducted indicate that the oil sprays do not possess any fungicidal properties nor do they affect the beneficial parasitic fungi.

Classification of the Aleyrodidae, Part 1, A. L. QUAINANCE and A. C. BAKER (*U. S. Dept. Agr., Bur. Ent. Bul. 27, pt. 1, tech. ser., pp. 93, pls. 34, figs. 11*).—This paper deals with the morphology and classification of the Aleyrodidae, or so-called white flies, several species of which are of great economic importance while others are becoming so.

The family consists of 3 subfamilies, namely, Udamoselinae, represented by a single genus and species (*Udamoselis pigmentaria*); Aleurodicinae, erected by the authors and represented by 4 genera (*Dialeurodicus* n. g., *Leonardius* n. g., *Aleurodicus*, and *Paraleyrodes*) and 28 species; and Aleyrodinae, represented by 3 genera, namely, *Aleurochiton*, *Neomaskellia* n. g., and *Aleyrodes*, the first 2 of which are represented by 3 species, while the last mentioned is reserved as the subject of a later publication.

Of the 32 species here described, 8 are characterized for the first time.

The sugar-beet webworm (*Loxostege sticticalis*), F. B. PADDOCK (*Jour. Econ. Ent., 5 (1912), No. 6, pp. 436-443, pl. 1*).—A report of biological studies carried on at Sterling, Colo., during an outbreak of this pest in the summer of 1909 and continued during 1910.

A serious walnut pest (*Ephestia elutella*), F. MASKEW (*Mo. Bul. Com. Hort. Cal., 1 (1912), No. 8, pp. 366-371, figs. 7*).—This is a brief report of observations based upon material taken at quarantine from a shipment of 70 bags of walnuts from Shanghai, China, which had been imported from Manchuria. While recorded as being cosmopolitan in its distribution, thus far there are no records of its establishment in California, or even of having previously been observed in California.

A contribution to the knowledge of blood-sucking Ceratopogoninae of Brazil, A. LUTZ (*Mem. Inst. Oswaldo Cruz, 4 (1912), No. 1, pp. 1-33*).—This paper deals with the classification and biology of these flies.

A contribution to the knowledge of the biology of blood-sucking Diptera, A. LUTZ (*Mem. Inst. Oswaldo Cruz, 4 (1912), No. 1, pp. 75-83*).—This paper deals with the mouth parts of blood-sucking Nematocera, the oviposition of the Brazilian species of *Simulium*, the greenish blood of Tabanidae and other Diptera, and *Paltostoma torrentium*.

Will the Mediterranean fruit fly (*Ceratitis capitata*) breed in bananas under artificial and field conditions? H. H. P. SEVERIN and W. J. HARTUNG (*Jour. Econ. Ent., 5 (1912), No. 6, pp. 443-451, fig. 1*; *Mo. Bul. Com. Hort. Cal., 1 (1912), No. 9, pp. 566-569*).—"Mediterranean fruit flies were bred both under artificial and field conditions from ripe and overripe bananas with the peel intact and from ripe bananas with the pulp exposed. Under laboratory conditions, the peel of a green Chinese banana was removed around a longitudinal split extending within the pulp; decay set in along this crack and from this banana fruit flies were also bred. Under field conditions, green Chinese bananas were hung among the branches of lemon trees; and from these bananas, when they became ripe and overripe, adults were reared. Fruit flies

also emerged under field conditions from 2 bananas which were removed from the bunches of banana trees that had been cut down during the mosquito campaign in Honolulu."

Cherry fruit flies (*Rhagoletis cingulata* and *R. fausta*) and how to control them, J. F. ILLINGWORTH (*New York Cornell Sta. Bul.* 325, pp. 191-204, pls. 9).—Cherry fruit flies are said to have been the source of serious damage in orchards about Ithaca for a number of years, late sour cherries, however, apparently being the only ones affected. Investigations of these flies in 1912 led to the discovery that two species, *R. cingulata* and *R. fausta* were about equally concerned in the injury, although it had previously been supposed that *R. cingulata* was the sole source. In a search through the literature the author found one instance in which *R. fausta* was reported to attack cherries, this infestation having been in an orchard at Victoria, British Columbia, in 1904 to 1906 (*E. S. R.*, 19, p. 959). A brief study, however, led to the assumption that it is widely scattered along the northern border of the United States, working in association with the common cherry fly.

Technical descriptions are given of its several stages. Although the indications are that the common cherry fly is a rather general feeder, attacking all varieties of cherries and sometimes plums, thus far *R. fausta* has been found only in sour cherries. The flies emerge about June 10 in the region around Ithaca, N. Y. They mate when 5 or 6 days old and begin ovipositing about 2 weeks after they emerge. The eggs are inserted into the fruit by means of a sharp ovipositor, and hatch in approximately 2 to 4 days. The number of eggs produced by each female is probably 300 or 400. In 1912 the first tiny larvæ were found June 30, about the time that the early varieties of cherries were being marketed. The infested fruit does not fall from the tree, but soon decays. The presence of the larvæ can often be recognized by the fruit having a small hole near the upper side, probably cut by the maggot for air. When the larvæ are mature, about the middle of July, they fall to the ground and bury themselves about 1 in. Here they change into pupæ and lie dormant until the next season."

Applications of a poison bait consisting of arsenate of lead 5 lbs., molasses 3 gal., and water 100 gal., made on June 10 and June 24, resulted in reducing the infestation from one-third of the crop, as occurred on the unsprayed trees, to about one-sixth of 1 per cent. The sprayed fruit also showed a noticeable lack of brown rot and curculio injury. The author thinks that possibly arsenate of lead without sweetening may control the cherry fruit flies.

A remedy for chrysanthemum leaf miner, J. G. SANDERS (*Jour. Econ. Ent.*, 5 (1912), No. 6, p. 472).—In experiments carried on during an outbreak of the chrysanthemum leaf miner (*Napomyza chrysanthemi*), nicotin solutions, especially black leaf 40 used as a spray with or without whale oil soap solution, proved to be a satisfactory means of control. One part of nicotin in 400 parts of water killed the eggs and larvæ readily, as well as newly-formed pupæ. The pupæ of all ages were killed with a 1:200 nicotin solution. The nicotin affects the larvæ through the leaf epidermis by osmosis.

Report on rat fleas in Suffolk and North Essex, C. STRICKLAND and G. MERRIMAN (*Parasitology*, 6 (1913), No. 1, pp. 2-18, figs. 3).—Previously noted from another source (*E. S. R.*, 28, p. 757).

Life history and habits of *Trogoderma tarsale*, a museum pest, J. E. WOODSEDALEK (*Ann. Ent. Soc. Amer.*, 5 (1912), No. 4, pp. 367-382, figs. 5).—The author's summary of variations in the life history of different individuals of the same generation of this coleopteron is as follows: "The adults lay eggs from 3 to 7 days after emergence. The number of eggs laid by different individuals

varies from 5 to 62. The eggs hatch in from 10 to 16 days, depending largely on temperature. Larval life lasts from 5 to 40 months or more. The time of pupation is from 11 to 17 days. The age of adults varies from 10 to 32 days."

Biological record of little grass billbug (*Sphenophorus parvulus*), R. I. SMITH (*North Carolina Sta. Rpt. 1912, pp. 136-140*).—Two hundred and fifty-five eggs were laid between May 19 and October 7, a period of 142 days. Seven eggs was the greatest number laid in any 24 hour period. The female was alive and healthy on October 27, when daily observations were discontinued; and was still alive but lying buried in the soil on November 20 when last seen. The average incubation period proved to be about 7 days during the early days of June, and about 6 days during July and August. During the last of September, when much cooler weather prevailed, some eggs took fully 11 days to hatch. The larval stage for the 7 specimens recorded varied from 31 to 60 days, a condition which the author believes to be comparable with normal field conditions. The pupal stage covers about 9 days, dependent somewhat on heat and moisture conditions. Moisture, however, does not seem to be as necessary as warmth, for some of the pupa developed normally in a very dry cell. A second generation may occur if the proper conditions prevail.

[Report of work with the corn billbug (*Sphenophorus callosus*)], R. I. SMITH (*North Carolina Sta. Rpt. 1912, pp. 105-135*).—In continuation of preliminary investigations of the corn billbug, previously noted (*E. S. R.*, 26, p. 862), the author presents a detailed account of studies of its life history and habits, which he finds to be as follows: "Eggs are first laid about May 20 in corn plants or the larger species of *Cyperus* and possibly in other sedges. The eggs require an average of 6 days for hatching. Egg laying continues until the latter part of September. The larvæ feed in the stalk or root of the plants and become full-grown in an average period of about 33 days. Larvæ of all ages occur from June to after November 30, but the majority are full-grown before November 1. The pupæ occur in cells in the stalk of the food plant or in the soil underneath the roots. Nine days is the average duration of the pupal stage. The beetles mature and usually emerge and feed during the months from July 1 to November 1 or later. These beetles do not often mate and lay eggs until the following spring, after emerging from hibernation."

Notes on *Lixus concavus*, H. B. WEISS (*Jour. Econ. Ent.*, 5 (1912), No. 6, pp. 434-436).—These notes relate to the biology of *L. concavus*, commonly known as the rhubarb curculio.

Dock (*Rumex crispus*) appears to be the favorite food plant of the larvæ. Sunflower and thistle were examined by the author for egg punctures with negative results, and in one instance only were eggs found in a species of *Polygonum* or smartweed.

Oviposition is said to commence soon after emergence, eggs having been collected in the field on June 1; it may continue until July 20, although the greater number of eggs are deposited before the middle of June. In the laboratory eggs hatched in from 7 to 9 days. From 8 to 9 weeks are required for the larvæ to reach maturity. In the field the majority were pupating from the second to the fourth week in August. Many adults emerged during the first week in September, practically all by September 11. The pupal period as determined in the laboratory varied from 10 to 12 days. The adults apparently go into winter quarters soon after emergence.

It is said that if *R. crispus* is cut off several inches from the ground between the middle and end of July and rain occurs soon afterwards, a large percentage of the larvæ will die owing to the decay which sets in, since practically all are in the roots at that time.

Coleoptera: General introduction and Cicindelidæ and Paussidæ, W. W. FOWLER (*London, Calcutta, and Berlin, 1912, pp. XX+529, figs. 240*).—The present volume, which is one of the series of *The Fauna of British India*, including Ceylon and Burma (E. S. R., 25, p. 557), deals with the Coleoptera, including a general introduction (pp. 1-218), and parts on the Cicindelidæ (pp. 219-443), the Paussidæ (pp. 444-500), Rhysodidæ (pp. 501-512), and Cupedidæ (pp. 513-515). In the introduction the essential characters are given for each family, of which 103 are recognized by the author, and short accounts of their habits, larvæ, distribution, and peculiar forms. A glossary of the technical terms used is included.

Diptera: Nematocera (excluding Chironomidæ and Culicidæ), E. BRUNETTI (*London, Calcutta, and Berlin, 1912, pp. XXVIII+581, pls. 12, figs. 44*).—This volume, another of the series of *The Fauna of British India*, including Ceylon and Burma, noted above, deals with the Indian Nematocera, excluding the Chironomidæ and Culicidæ.

An introduction to bee culture, R. G. WARRY (*Dept. Agr. N. S. Wales, Farmers' Bul. 59, 1913, pp. 10, figs. 5*).—A practical guide.

A handbook of bee keeping.—IV, The life of the bee, E. ZANDER (*Handbuch der Bienenkunde in Einzeldarstellungen. IV, Das Leben der Biene. Stuttgart, 1913, pp. X+151, figs. 120*).—This fourth volume deals largely with the biology of the honey bee (E. S. R., 26, p. 253).

Rearing queen bees, R. G. WARRY (*Dept. Agr. N. S. Wales, Farmers' Bul. 62, 1913, pp. 14, figs. 2*).—Detailed directions are given.

Bee diseases in Ontario, M. PERTIT (*Ontario Dept. Agr. Bul. 213, 1913, pp. 15, figs. 6*).—A revision of Bulletin 197, previously noted (E. S. R., 27, p. 458).

Sacbrood, a disease of bees, G. F. WHITE (*U. S. Dept. Agr., Bur. Ent. Circ. 169, pp. 5*).—This is a preliminary discussion of a disease of bees which differs from foul brood, and of which samples have been received from all the States of the Union, except 3, and also from Canada.

The strength of a colony in which sacbrood is present is frequently not noticeably diminished, but when the brood is badly infected the colony becomes appreciably weakened thereby. The brood dies after the time of capping. The dead larvæ are almost always found extended lengthwise in the cell, lying with the dorsal side against the lower wall, and it is not unusual to find many larvæ dead of the disease in uncapped cells, such brood having been uncapped by the bees after it died. In this disease the cappings are frequently punctured by the bees and occasionally a capping has a hole through it, indicating that the capping itself had never been completed. "A larva dead of this disease loses its normal color and assumes at first a slightly yellowish tint. 'Brown' is the most characteristic appearance assumed by the larva during its decay, but various shades are observed, and the term 'gray' might sometimes appropriately be used to designate it. The form of the larva dead of this disease changes much less than it does in foul brood. The body wall is not easily broken, as a rule. On this account often the entire larva can be removed from the cell intact. The content of this saclike larva is more or less watery. The head end is usually turned markedly upward. The dried larva or scale is easily removed from the lower side wall. There is practically no odor to the brood combs."

Through feeding experiments with filtrates obtained from sick and dead larvæ, the author has determined that the disease is caused by a filterable virus. Sacbrood has been produced experimentally in 11 colonies by feeding to healthy colonies the virus of this disease. In 8 of the 11 colonies the disease was produced by virus that had passed through the Berkefeld filter.

Experimental investigations of the poison of the hornet (*Vespa crabro*), E. BERTARELLI and A. TEDESCHI (*Centbl. Bakt. [etc.], 1. Abt., Orig., 68 (1913)*),

No. 3-4, pp 309-317, figs. 2).—An experimental study leads the authors to conclude that the poison secreted by hornets acts very similarly to that of bees and wasps.

Note on a parasite of white grubs, W. P. FLINT and G. E. SANDERS (*Jour. Econ. Ent.*, 5 (1912), No. 6, p. 490).—The authors report that *Myzine sexcincta* has been taken in considerable numbers behind the plow in central and northern Illinois during the past 3 years, and that over 75 per cent had parts of white grubs attached. It is said to be nearly as abundant in the district under observation as is *Tiphia inornata*.

Observations on the biology of Ixodidæ, G. H. F. NUTTALL (*Parasitology*, 6 (1913), No. 1, pp. 68-118, figs. 2).—A summary of previous observations, together with a report of those by the author and his assistants. The species dealt with are *Ixodes putus*, *I. canisuga*, *I. hexagonus*, *I. ricinus*, *Hæmaphysalis leachi*, *H. punctata*, *Hyalomma egyptium*, and *Rhipicephalus appendiculatus*. See also a bulletin on the biology of ticks by Hooker et al. previously noted (*E. S. R.*, 27, p. 865).

The fowl tick (*Argas miniatus*), F. C. BISHOPP (*U. S. Dept. Agr., Bur. Ent. Circ.* 170, pp. 14, figs. 5).—A popular account of the fowl tick, including preventive and remedial measures.

The anatomy of *Argas persicus*, L. E. ROBINSON and J. DAVIDSON (*Parasitology*, 6 (1913), No. 1, pp. 20-48, pls. 6, figs. 2).—An anatomical study of the fowl tick.

An acarid enemy of the linden, BOUVIER (*Bul. Soc. Nat. Agr. France*, 72 (1912), No. 7, pp. 658-660; abs. in *Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 11, p. 2541).—Serious damage is said to have been caused by an acarid, probably *Tetranychus tiliarum*, to the linden or lime tree in the vicinity of Paris.

An introduction to the study of the Myriapoda, C. E. PORTER (*Bol. Mus. Nac. Chili*, 4 (1912), No. 1, pp. 16-68, figs. 23).—An account of the structure and habits of the Myriapoda with an annotated list of the 64 species described from Chili.

An extensive bibliography is appended.

Bacterium pseudoepistis murium n. sp., B. GALLI-VALERIO (*Centbl. Bakt. [etc.]*, 1. Abt., *Orig.*, 68 (1913), No. 2, pp. 188-194, figs. 5).—This name is given to a bacterium which has been isolated from the lymphatic glands, the thyroid gland, the testicles, and the spleen of *Mus rattus*.

In experiments conducted the disease was brought about by spring water from Jura but not by water from Lausanne. Examinations of the Jura water showed the presence of 50 colonies per cubic centimeter and the absence of colon bacilli. The organism is of particular interest because of its frequent localization in the thyroid gland.

FOODS—HUMAN NUTRITION.

A study of the chemical changes occurring in meats during the process of drying by the vacuum method, L. H. DAVIS and A. D. EMMETT (*Jour. Biol. Chem.*, 14 (1913), No. 2, *Proc.*, p. XLII).—According to the authors' summary of data, presented at the seventh annual meeting of the American Society of Biological Chemists, on "calculating the data for the fresh and desiccated meats to the dry basis using the two values for dry substance—the vacuum and the oven-heated—the results agree quite closely for the various constituents, the greatest differences being in the fat as was to be expected."

Analysis of meat preparations manufactured in the Departments of Ille-et-Vilaine, Côtes, du Nord, and Mayenne, G. PERRIER and L. FARCY (*Ann. Falsif.*,

6 (1913), No. 52, pp. 89-94).—A report of methods and results of official analyses of meat patties, cheese, meat jellies, sausages, and similar goods.

Notes on preserving eggs in China, J. HANZAWA (*Centbl. Bakt. [etc.]*, 2. Abt., 36 (1913), No. 15-18, pp. 418, 419).—Three ways of preserving ducks' eggs common in the provinces of Tschekiang and Kiangssu are here described.

One form (Pidan) is prepared by coating the eggs with a mixture of red clay, lime, salt, and water, and allowing them to stand 5 or 6 months. The whites are then coagulated into a brown, transparent, gelatinous mass containing tyrosin-like crystals. The yolks are dark green and have the consistency of thick soup. The eggs are eaten with or without soy and sugar. The second form (Hueidan) is obtained by leaving the eggs for 3 weeks in a mixture of red clay, salt, and water. The yolks become reddish yellow and the eggs are eaten cooked with soy and sugar. The third form (Dsaudan) is simply left for 5 or 6 months in a tightly closed dish.

The changes in the first 2 forms are popularly ascribed to salt, but in the opinion of the author they are due to micro-organisms. He obtained 5 species of bacteria from Pidan eggs. Fresh eggs inoculated with cultures of these bacteria underwent changes similar to those which had occurred in the original eggs.

[Chemical examination of milk and ice cream], J. O. HALVERSON (*Bul. Dept. Food and Drug Insp. Missouri*, 4 (1912), No. 7-11, pp. 3-49).—Results are given of the examination of a large number of samples.

Cheese, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul.* 247, 1913, pp. 19).—Analyses are given of 141 samples of cheese purchased throughout Canada.

The nutritive value of overripe cheese, H. KÜHL (*Pharm. Zentralhalle*, 53 (1912), No. 32, pp. 883-888; *Hyg. Rundschau*, 23 (1913), No. 4, pp. 185-192).—The normal ripening processes in various types of cheese are here described, and the more important investigations as to the chemical and bacteriological changes which affect the various nutrients in overripening are summarized. A few original observations and practical suggestions are given and a brief list of publications on the subject is appended.

Studies of yoghourt, with special reference to dried preparations, M. HÖHNADL (*Arch. Hyg.*, 78 (1913), No. 4-5, pp. 193-217, pl. 1).—The history of the use of milk fermented with *Bacterium bulgaricum* in diets for gastric and intestinal disorders or as an intestinal disinfectant is reviewed and brief descriptions are given of the preparation of yoghourt in eastern Europe.

Maya, obtained from old yoghourt much as leaven is obtained from bread dough, is used as the medium of fermentation. Original experiments are reported designed to test the efficiency of the micro-organisms of the maya after preservation in tablet or other desiccated form. The conclusion is reached that the dried maya products contain living yoghourt bacteria. Living *Bacterium bulgarica* were also found in commercial preparations several years old. Liquid cultures undoubtedly work more quickly, but the keeping qualities and resistance of the dried preparations increase their practical value.

A bibliography of the subject is appended.

Important vegetable foodstuffs of the natives in German protectorates, ADLUNG (*Tropenpflanzer*, 16 (1912), Nos. 10, pp. 547-555; 11, pp. 609-615; 12, pp. 662-669).—This descriptive summary of the most important native vegetable foods of German Africa was made partly in the hope of preserving information regarding certain rapidly disappearing forms. It includes notes on the habitat, culture, nutritive value, ways of utilization, and export of the various plants. Among the less known plants described are the ground almond (*Cypertus esculentus*), a variety of millet (*Pennisetum spicatum*), the Vigna bean (*Vigna*

sinensis) and other legumes. Naras (*Cucurbitacea acanthosicyos horrida*), Sapotacea (*Butyrosperm parkii*), etc.

Soluble nitrogen as a factor in judging flours, E. ROUSSEAU and M. SIROT (*Ann. Falsif.*, 6 (1913), No. 52, pp. 78-84).—The studies here reported were inspired by the difficulty of determining the bread-making qualities of flour by ordinary laboratory analysis. Several qualities of flour were analyzed with special reference to the proportion of soluble to insoluble nitrogen contained, and the following conclusions were drawn:

In flours of good bread-making quality the ratio of total to soluble nitrogen is about 5.72:1. When this ratio fell below 5.2:1 the flour was in all cases inferior for bread making. Acidity appears to be of little use as a criterion as it is often low in poor flours, and the ratio of total to soluble nitrogen is believed by the authors to be the best guide yet found in determining the baking quality of flour.

The technique of sour dough fermentation, M. P. NEUMANN and K. MOHS (*Ztschr. Gesam. Getreidew.*, 5 (1913), No. 2, pp. 56-66, figs. 9).—Experiments regarding the behavior of sour dough in rye bread making are here reported, special reference being made to the effect of time and heat employed and the amounts of moisture and leaven in the dough during different stages of fermentation.

Vegetables—their food value and preparation, ELIZABETH JEFFERSON and MARY EDMONDS (*Agr. Col. Ext. Bul. [Ohio State Univ.]*, 7 (1912), No. 10, pp. 16, figs. 11).—A summary of information regarding the nutritive value of vegetables and directions for vegetable cookery, designed particularly for teaching purposes.

Candy making revolutionized—confectionery from vegetables, MARY E. HALL (*New York*, 1912, pp. XI+154, pls. 6, figs. 3).—In this book a system of candy making is described with various vegetables as ingredients.

It is claimed that this candy will insure against the dangers of overeating, since the large bulk obtained by the addition of the vegetable material will satisfy the appetite before too much sugar is eaten. It does not seem that this would be always the case as in some instances the bulk of the vegetable does not appear to be large enough. The vegetables are believed to give certain flavors and colors which are desirable.

Full directions and a large number of recipes are given.

Canned tomatoes, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul.* 246, 1912, pp. 23).—Data are given regarding 140 samples of canned tomatoes examined.

Soaking nuts, M. and L. RIGOTARD (*Ann. Falsif.*, 6 (1913), No. 52, pp. 95, 96).—After harvesting, nuts are frequently subjected to washing and sulphuring, with a view to improving the keeping quality.

In the opinion of the authors, sulphuring does not change the flavor of the nuts or cause deterioration unless the shells are cracked. The practice of soaking old nuts to give them the appearance of new is, on the other hand, to be condemned as fraudulent. According to the authors, there are no accurate figures to show the increase of weight by such soaking, nor has any test of the quality of the nut meats yet been found other than simple tasting. The question is of special importance among French producers since American dealers are inclined to refuse all importations from regions where the practice is suspected to exist.

The adulteration of jams, E. MARRIAGE (*Jour. Roy. Soc. Arts*, 61 (1913), No. 3144, pp. 371-384).—This paper treats of the practice of some English manufacturers of adding the juices of less expensive fruits in the manufacture of the more expensive jams, and the sale of these products as "improved" jams.

Methods for the detection of such jams are suggested. A discussion follows the paper.

Fifth annual report of the food and drug commissioner of Texas, J. S. ABBOTT (*Ann. Rpt. Food and Drug Comr. Texas*, 5 (1912), pp. 40, pls. 5, fig. 1).—Data are given regarding the examination of a number of food products and drugs, together with information regarding the work which has been carried on under the state pure food and drug law.

Of special interest is the information regarding the shelled pecan industry. Of the two practices of shelling the cracked nuts in the factory under supervision and sending the cracked nuts to laborers' homes for shelling, the latter is regarded as unsanitary, it having been found that such pecans "were shelled sometimes under very unsanitary and always under unregulated conditions. . . .

"It is a difficult matter for the State to supervise and to regulate the sale of shelled pecans gathered and shelled by individuals who gather only a few barrels a season. Those who want pecans to eat raw should buy the pecans with the shell on and not simply the kernel. If the pecans are to be cooked into candy or cake, it is safe to buy the shelled pecan."

The results are given of a study of different brands of wrapped cured bacon, including the actual weight as compared with the weight claimed, the weight of the meat, the weight of the wrapper, and the percentage of moisture in the meat. The figures show "that some meats are better cured than others and some contain more weight of wrapping material than others. It is difficult, however, to locate the origin of the misbranding in these cases, as the weight is always indicated with a pencil, and the natural shrinkage can not always be determined. The consumer can protect himself by weighing what he buys."

[Chemical examination of foods and dairy products], J. Q. EMERY ET AL. (*Bien. Rpt. Dairy and Food Comr. Wis.*, 1911-12, pp. 59-191, pls. 9).—Analyses are given of a large number of samples together with the reports of the inspectors.

Manual of the Illinois Dairy and Food Law, sanitary food law, oleomargarine law, stock food law, and rules for labeling (*Springfield, Ill.*, 1911, pp. 59).—This manual contains the text of the laws as amended and in force July 1, 1911, and rules for labeling drawn up by the state food commissioner.

The dairy and food laws of the State of Michigan with supreme court decisions relating thereto (*Lansing, Mich.*, 1911, pp. 152).—A compilation of the laws regulating the manufacture and sale of foods, drugs, and dairy products, together with some decisions of the supreme court relative to them and a brief abstract of these laws and decisions.

The food and drugs act (*U. S. Dept. Agr., Office Solicitor Circ.* 70, pp. 5).—This is a decision of the court of appeals of the District of Columbia, affirming a decree of the supreme court of the District of Columbia in a proceeding by way of libel for the condemnation and forfeiture of adulterated flour.

Childs recipes for cooking and preparing—serving and portion list (*New York*], 1913, pp. 90).—Recipes and directions are given for the preparation of a large number of dishes, particularly those adapted to restaurant service.

The portion and serving list shows the amount of many foods required for one service and gives brief directions as to the proper dishes and methods of service. In an appendix, rules for testing milk and the trade names of crockery and utensils are given, as well as a large amount of data regarding the number of fruits, vegetables, or other food materials in a barrel or box and the number of individual portions of cereals in a package, and information regarding the standards to be followed in selecting meats, fruits, and vegetables. This collection of data, evidently designed for private use, contains as a whole much

of interest regarding the preparation of food in quantities and regarding restaurant service.

The pages are bound together in a loose leaf volume.

Methods of metabolism experiments with men and animals for the chemical study of food and excretory products, A. WEITZEL (*Arb. K. Gsndhtsamt.*, 43 (1912), No. 2, pp. 304-312; *abs. in Zentbl. Biochem. u. Biophys.*, 14 (1913), No. 13-14, p. 470).—A résumé of methods employed in the official health bureaus, and similar data.

The amount of water required by infants, L. F. MEYER (*Ztschr. Kinderheilk.*, 5 (1912), No. 1; *abs. in Zentbl. Expt. Med.*, 3 (1913), No. 4, p. 158).—In experiments planned to determine the amount of water required by nursing infants, young infants were fed with concentrated milk to which albumin and sugar had been added and which had a fuel value of 1,200 calories per liter.

In many cases the body weight remained constant, while it decreased in a few. One hundred fifty gm. of water per kilogram of body weight was found necessary to bring an increase in weight. No conclusive results regarding the metabolism of nitrogen and mineral matters were obtained from comparative experiments in which diets of low and high water content were successively given.

The regulation of neutrality in the animal body, L. J. HENDERSON (*Science*, n. ser., 37 (1913), No. 950, pp. 389-395).—This address, delivered at the joint meeting of the American Physiological Society and the American Society of Biological Chemists, "is concerned with those physiological processes whereby the normal reaction of the body fluids is permanently preserved." The argument is summed up by the author as follows:

"Within wide limits of amount any acid or base may be poured into the organism, and the reaction will not vary; nor will it vary if such be produced by the organism, and this constancy will protect all enzymatic processes, the function of respiration, and the whole distribution of material throughout the body. . . . While life endures, the dynamical equilibrium of hydrogen and hydroxyl ionizations persists."

Studies of the excretion of acid, L. J. HENDERSON and W. W. PALMER (*Jour. Biol. Chem.*, 14 (1913), No. 2, *Proc.*, pp. XXV, XXVI).—Some of the deductions follow which appear in this summary of a paper presented at the seventh annual meeting of the American Society of Biological Chemists:

"The ammonia [in urine] appears to be an index of the degree of acidosis only in those cases where β -oxybutyric acid is produced.

"The relation between hydrogen ion concentration and total quantity of acid excreted appears to provide an index of the efficiency of the kidney in carrying out the important process of acid excretion; this 'functional test' possesses the advantage that it involves no experimental interference.

"We have reached the conclusion that mild states of acidosis are far more common than has been suspected, and that the therapeutic use of alkali in small quantities (until the urine reaches the reaction of blood) is often desirable."

Feeding experiments relating to the nutritive value of the proteins of maize, T. B. OSBORNE and L. B. MENDEL (*Jour. Biol. Chem.*, 14 (1913), No. 2, *Proc.*, pp. XXXI, XXXII).—A summary of a paper presented at the seventh annual meeting of the American Society of Biological Chemists, discussing data previously noted (*E. S. R.*, 28, p. 759).

On the utilization of ammonia nitrogen in the protein metabolism, A. E. TAYLOR and A. I. RINGER (*Jour. Biol. Chem.*, 14 (1913), No. 2, *Proc.*, pp. XXVI, XXVII).—A brief summary of a paper presented at the seventh annual meeting

of the American Society of Biological Chemists. The experiments reported confirm the results of earlier investigators and also show that starving and diabetic animals may retain a considerable part of the nitrogen ingested as ammonium carbonate.

Concerning purin metabolism in man.—I, Are the purin bodies intermediate or terminal metabolic products? V. O. SIVÉN (*Pflüger's Arch. Physiol.*, 145 (1912), No. 5-6, pp. 283-297).—As a result of original experiments on normal subjects, the purin content of whose diet was carefully regulated, the author holds that the purin bodies excreted by the human organism are terminal products.

A large part of the exogenous purins ingested with the food undergoes considerable alteration in the digestive tract. Part is resorbed, together with the purin nuclei, and undergoes no further transformation, but is given off from the kidneys in the form of purin bodies in a comparatively short time (from 12 to 15 hours). The reason that purin bodies, whether exogenous or endogenous, which enter the circulation, undergo no further alteration, such as would break the purin cycle, is that the human organism lacks uricolytic power.

Concerning purin metabolism in man.—II, Are the endogenous purin bodies products of the activity of digestive secretions? V. O. SIVÉN (*Pflüger's Arch. Physiol.*, 146 (1912), No. 10-12, pp. 499-516; *abs. in Chem. Zentbl.*, 1912, II, No. 9, p. 732).—A controversial article. See also above.

Transformation of sugars in the human organism, J. PARNAS and J. BAER (*Biochem. Ztschr.*, 41 (1912), No. 5, pp. 386-418).—It is stated that the chemical processes by which the transformation of the glucose molecule into carbon dioxid and water take place have not yet been explained. Only lactic acid has been determined as an intermediate product of the metabolism in the muscles.

It has been assumed by some that the transformation of lactic acid to glucose is simply an inversion of the same process. If this means that the reaction is one of chemical equilibrium, the author is unwilling to admit this view, partly because it is unsupported by evidence, and partly because it may involve admitting the possibility of a reversible action in enzymes. But, if it were possible to show a series of intermediate changes in the transformation of lactic acid to glucose, the opposite of those demonstrated in the transformation of glucose to lactic acid, the reaction could be considered one of oxidative disintegration. Such an assumption would clarify certain practical points, such as the ability of a muscle to work without oxygen but not to restore itself, or the excretion of lactic acid in cases of poisoning by phosphorus or arsenical substances which interfere with the normal metabolism, and cause an unusual disintegration of glucose or glycogen. It may also indicate the mechanism by which the neutrality of body substances is maintained.

Transformations of the carbohydrates in the animal organism, J. PARNAS (*München. Med. Wchnschr.*, 59 (1912), No. 32, p. 1788; *abs. in Med. Rec.* [N. Y.], 82 (1912), No. 10, p. 437).—A continuation of the above discussion.

Studies on the formation of glycocoll in the body, II, A. A. EPSTEIN and S. BOOKMAN (*Jour. Biol. Chem.*, 13 (1912), No. 2, pp. 117-131).—Free leucin administered with benzoic acid was decomposed in the body but did not yield glycocoll. Benzoyl leucin with benzoic acid increased the production of hippuric nitrogen to a greater extent than the leucin radical of the compound alone could furnish, which was due in part to the leucin radical and partly to the independent action of the benzoyl radical. The increase in production of glycocoll observed in fasting animals poisoned with phosphorus and given benzoic

acid was attributed to the excessive decomposition of protein which yielded additional material available for synthesis.

No evidence was found in these experiments of the conversion of native leucin into glycocoll. It appears likely that much of the glycocoll liberated upon feeding benzoic acid is the result of a synthetic process in the body.

The influence of the composition and amount of the mineral content of the ration on growth, E. V. McCOLLUM and MARGUERITE DAVIS (*Jour. Biol. Chem.*, 14 (1913), No. 2, *Proc.*, p. XL).—According to the authors' summary of data presented at the seventh annual meeting of the American Society of Biological Chemists, young rats fed upon the wheat kernel, either alone or with the addition of wheat gluten, and distilled water did not grow, but if this ration were given a mineral content similar to that of milk powder normal growth was induced during 70 days.

Rats which grew normally during 75 to 100 days on rations consisting of casein, dextrin, and agar-agar, with a mineral content similar to that of milk or eggs, failed to grow if these rations had a mineral content similar to that of the wheat kernel. The addition of calcium or the subtraction of magnesium induced growth in some degree.

Much experimental evidence indicates that an important relation exists between the mineral elements and the protein content of the diet.

[Calcium and magnesium in Asiatic foodstuffs], E. AEDERHILDEN and R. HANSLIAN (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 80 (1912), No. 2, pp. 113-120; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 600, II, 962).—As bladder stones are very common in Asia Minor, the hard water and high inorganic content of the principal grain (Borghul) eaten in this region are considered to be important in the etiology of the complaint.

On the question of food-poisoning bacteria, G. MAYER (*Jour. State Med.*, 21 (1913), No. 2, pp. 98-102).—This article gives the results of a bacteriological study of an epidemic of food poisoning caused by eating fish which was infected with *Bacillus proteus vulgaris*, and a discussion of bacterial food poisoning and its relation to paratyphoid infection.

ANIMAL PRODUCTION.

A contribution to the theory of growth, W. E. KELLCOTT (*Verhandl. Internat. Zool. Kong. Graz*, 8 (1910), pp. 597-601).—It is stated that the growth of the organism as a whole, when measured by the increase of total length or weight, gives little real indication of the true phenomena of growth among the higher organisms, as this is a close net resultant of variously growing separate parts. For example, in vertebrates the muscles and connective tissues may be approximately 75 per cent of the total weight of the organism. It is, therefore, chiefly the rate of growth of these tissues that gives character to the rate of growth of the whole organism, and yet these parts may be of less importance to the organism than other parts such as the brain or heart. In cases of under-feeding, all of the tissues of the organism are not similarly affected. In many cases certain parts or tissues, as the mammary glands, grow independently of the rest of the organism and their growth is regulated or caused by specific secretions, or hormones.

"It seems quite likely, therefore, that in organisms in general the normal growth of each tissue or even each organ is controlled separately by a specific internal secretion. These substances may regulate growth either through inhibition or acceleration and the effect produced may be due either to the presence or the withdrawal of the specific substance."

On the energy expenditure required for growth, A. GOUIN and P. ANDOUARD (*Compt. Rend. Soc. Biol. [Paris]*, 72 (1912), No. 17, pp. 773-775; *abs. in Zentbl. Expt. Med.*, 2 (1912), No. 11, p. 495).—Experiments extending over 7 years were made with young cattle to determine the energy expenditure required for growth.

Apparently, this expenditure is a direct function of the volume of the body, and is equivalent to 67.6 per cent of the caloric value of the assimilated matter. The values for such energy expenditure calculated from theory were within 2 per cent or less of the values found by experiment.

Sugar in the nutrition of man and animals, J. CROCHETELLE (*Sucr. Indig. et Colon.*, 81 (1913), No. 4, pp. 74-78; 5, pp. 100-103; 6, pp. 125-129).—A summary of information on the nutritive value of sugar, molasses, and molasses feeds.

Lignocelluloses and animal assimilation, C. F. CROSS (*Chem. World*, 2 (1913), No. 2, pp. 45, 46).—A critical discussion of the digestibility of "crude fiber" and "sawdust," with special reference to the need of investigations based on a thorough understanding of the chemical process involved.

The influence of function on the lime requirements of animals, H. STEENROCK and E. B. HART (*Jour. Biol. Chem.*, 14 (1913), No. 2, pp. 59-73).—A lime balance was maintained by a pig fed on a ration with a low lime content. Calcium phosphate added to the ration was found to be a readily available source of lime. A negative lime balance resulted from a ration of acid-extracted foods having an initial low lime content.

A goat yielding 2 qt. of milk per day on a low lime ration gave a negative lime balance, though lime was available from oat straw. On a ration of oat straw alone the lime retention was small, and little tissue could be formed because of a deficiency in protein. After a return to normal condition and an abundance of lime in the ration a positive lime balance resulted.

The following conclusions are drawn: "The level of lime intake necessary for maintenance is dependent upon the functional activity of various organs of the body. A daily intake of about 0.3 gm. of CaO per 100 lbs. body weight covered the metabolism losses of a mature barren pig. From 0.4 to 0.5 gm. of CaO per 100 lbs. body weight covered the metabolism loss of a mature dry goat. The figures are not absolute and general, but will vary with the character of the ration.

"The mammary gland during its activity constitutes a severe drain upon the skeletal lime supply during periods of insufficient lime assimilation. During periods of insufficient phosphorus assimilation, it indirectly causes a waste of lime from the skeleton. An allowance of 1 gm. of lime in the ration per pound of milk produced by a goat or cow should theoretically be ample. This, of course, is in addition to the maintenance requirement. But at least twice the above amount would be safer, due to the large losses of lime in the intestine accompanying increased food consumption. The walls of the intestine with their normal secretions may cause the loss of a sufficient amount of lime to appreciably lower its 'coefficient of digestibility' during periods of sufficient lime ingestion. When such conditions are complicated by physiological disturbances a large negative balance of lime over an extended period of time may result. Under normal conditions with a low lime ingestion the usual intestinal losses may in themselves be the cause of a negative lime balance.

"Intestinal and urinary losses of lime do not parallel. With very heavy intestinal losses the urinary excretion may remain unchanged. A liberal assimilation of nitrogen does not necessarily imply an assimilation of lime, even when the animal's supply of lime is considerably depleted. These are separate and distinct functions of the alimentary tract. A perverted lime metabolism which

ultimately would end in an extreme impoverishment of the skeleton in lime may be merely the result of other physiological disturbances."

The effect of a high magnesium intake on calcium retention by swine, E. B. HART and H. STEENBOCK (*Jour. Biol. Chem.*, 14 (1913), No. 2, pp. 75-80).—A pig given a ration of corn, wheat, and bran retained a small amount of lime. Adding magnesium sulphate to this ration increased the urinary elimination of calcium, showing a negative balance of calcium. The addition of both magnesium sulphate and dicalcium acid phosphate reduced the urinary elimination of calcium caused by the magnesium sulphate alone, but increased the fecal elimination of calcium.

"The fact that the relation of phosphorus to calcium and magnesium in our grains is high, with the probable formation in the tract of magnesium phosphate and its excretion by way of the intestine, would help to explain the difference in the action of magnesium chlorid or sulphate and the magnesium normal to grains. The interrelations existing between mineral elements are important factors for consideration in studying the specific rôle of a mineral element in animal nutrition."

Diet deficiency and disease in live stock, F. E. PLACE (*Jour. Dept. Agr. So. Aust.*, 16 (1913), No. 7, pp. 764-773; *Amer. Vet. Rev.*, 43 (1913), No. 1, pp. 46-60).—A paper read before the veterinary section of the Australian Association for the Advancement of Science, in which attention is called to certain diseases caused by a deficiency of certain constituents in feeding stuffs.

In regard to the normal pulse rate of mammals, A. P. KNOLL (*Untersuchungen über die normale Pulsfrequenz der Rinder und Schweine nebst vergleichenden Physiologischen kritischen Studien über die normale Pulsfrequenz des Menschen und des Haussäugetiere. Inaug. Diss., Univ. Zurich, 1911, pp. 75; abs. in Ber. K. Tierärztl. Hochschule Dresden, n. ser., 6 (1911), pp. 46-48; Amer. Jour. Vet. Med.*, 8 (1913), No. 3, p. 170).—A report of experiments on the influence of age, sex, exercise, weather, underfeeding, and other factors on the pulse rate of cattle, pigs, and sheep.

The direct transfer of the food and drink of ruminants through swallowing, VÖLTZ (*Abs. in Deut. Med. Wchnschr.*, 38 (1912), No. 1, p. 41).—When a sheep was killed directly after drinking a large amount of water to which alcohol had been added, nearly all of the alcohol was recovered in the paunch, showing that liquids are not immediately transferred to the abomasum.

The biochemistry of the female genitalia, T. A. ERFF-LIEFKOVICS and J. ROSENBLUM (*Biochem. Bul.*, 2 (1913), No. 6, pp. 233-237).—Brief reports are given on a quantitative study of certain enzymes of the ovary, uterus, and bladder of pregnant and nonpregnant sheep, and on the absence of certain enzymes from the human chorion.

Influence of the spermatozooids on the blastula, II, J. H. F. KOHLBRUGGE (*Arch. Mikros. Anat.*, 77 (1911), No. 1, I, pp. 82-85, figs. 2).—The spermatozooids were found to pass through the zona pellucida of the blastula in bats and rabbits. In some cases they may even penetrate the blastula, but no definite data were obtained as to any permanent effect on the embryo.

The scientific and practical significance of artificial impregnation in mammals, E. IWANOFF (*Verhandl. Internat. Zool. Kong. Graz*, 8 (1910), pp. 623-631).—This contains brief notes on work done by the author and other investigators. The possibilities of overcoming sterility in the female and success in crossing species difficult to breed, together with other practical problems of heredity such as methods of keeping spermatozoa for transportation to considerable distances, are discussed.

Nucleus and cytoplasm in inheritance, A. SCHREINER (*Biol. Centbl.*, 32 (1912), No. 4, pp. 230-233; *abs. in Jour. Roy. Micros. Soc. [London]*, 1913, No. 1, pp.

56, 57).—The difficulties in the way of accepting the nucleus as bearing the chief rôle in inheritance are indicated.

Tetraplasy, the law of the four inseparable factors of evolution, H. F. OSBORN (*Jour. Acad. Nat. Sci. Phila.*, 2. ser., 15 (1912), pp.*273-309).—A summary and explanation of various biological principles which the author has previously discussed, especially the influence of environment, ontogeny, heredity, and selection on the evolution of plants and animals. See also a previous note (E. S. R., 27, p. 369). A bibliography is appended.

Concerning the problem of the carriers of heredity, F. VEJDovsky (*Zum Problem der Vererbungsträger*. Prague, 1912, pp. 184, pls. 12, figs. 16; rev. in *Arch. Mikros. Anat.*, 80 (1912), No. 3, II, pp. 124, 125).—A study of the finer structure of chromosomes and other cell structures in several species of invertebrates, with special reference to the transmission of the hereditary material from one generation to another. The mitochondria are not considered by the author as taking part in the process of inheritance. A bibliography of about 450 titles is appended.

Mendelism and interspecific hybrids, O. F. COOK (*Amer. Nat.*, 47 (1913), No. 556, pp. 239-245).—A discussion of the significance of alternative inheritance for the practical breeder. It is pointed out that the data on crosses of zebus and cattle, in an article previously noted (E. S. R., 28, p. 68), furnish a better illustration of the coherence of characters derived from the same parental stock than of a Mendelian freedom of combination of the contrasted characters. A comparison is made of these crosses with results obtained with cotton (E. S. R., 21, p. 40; 22, p. 37).

"The practical question to be determined is whether the Durham-like and Brahma-like individuals of the second and later generations are equal to the original parental varieties, and whether the intermediate individuals maintain the average of the first generation. . . . To increase the pure stock of Brahma cattle, and thus increase the possibilities of producing first generation hybrids, may be more important than the breeding of hybrid varieties. At least this is the suggestion to be drawn from the failure of many attempts to develop superior useful varieties of cotton and other seed-propagated plants from interspecific hybrids. As a barrier to a permanent union of two species degeneration in the second or later generations of a hybrid stock may be as effective as sterility in the first generation. It may prove very fortunate that Mr. Borden has imported Brahma cows as well as bulls, for this may make it possible to perpetuate the Indian breeds in Texas.

"A tendency to deterioration in the later generations of hybrids is likely to be marked as long as hybrids are crossed back on one of the parental stocks, instead of being bred with each other. This is because even dilute hybrids share some of the stimulation effect shown in the first generation. But these questions of vigor and fertility, though of fundamental importance in practical breeding, lie outside of the range of the Mendelian theory."

A simple test of the goodness of fit of Mendelian ratios, J. A. HARRIS (*Amer. Nat.*, 46 (1912), No. 552, pp. 741-745).—It is pointed out that the probable error between the observed and calculated results in breeding experiments must be judged by something more than an empirical inspection or by the method of Johannsen^a, except for the simple 3:1 ratios. By applying the formula furnished by Pearson^b, and using Elderton's^c tables, the author has suggested a comparatively simple and reliable method for determining the

^a Elemente der Exakten Erblchkeitslehre, pp. 402-410.

^b Phil. Mag. and Jour. Sci., 50 (1900), pp. 157-175.

^c Biometrika, 1 (1904), pp. 155-163.

errors of sampling inherent in work in genetics. Several illustrations of using the method are given.

Simplification of Mendelian formulas, W. E. CASTLE (*Amer. Nat.*, 47 (1913), No. 555, pp. 170-182).—The proposals for the simplification of Mendelian terminology are summarized briefly as follows: "(1) To abolish the current dual terminology and use only 1 symbol, where a single variation from the normal is involved. (2) To use a small letter to designate the factor responsible for a variation which is recessive in crosses with the normal. (3) To use a capital letter to designate the factor responsible for a variation which is dominant in crosses with the normal."

The principles of stock breeding, J. WILSON (*London*, 1912, pp. VI+146, figs. 2).—This book treats principally of Mendel's law and its possible application in the breeding of live stock. Some of the work already done on inheritance of color in horses and cattle and on inheritance of the milk yield in cows is discussed in detail in order to understand how the Mendelian discovery may advance our knowledge of inheritance in live stock, and at the same time indicate by example what may be possible by way of breeding in the future. There is a brief treatment of pre-Mendelian theories regarding the value of pedigree and other significant factors.

The descent of animals, J. A. JESSEN (*Amer. Jour. Vet. Med.*, 8 (1913), No. 3, pp. 133-139).—This is a paper read at the meeting of the Missouri Valley Veterinary Association, January, 1913. The problems of inheritance are discussed, and it is suggested that veterinarians and practical stock breeders should pay more attention to these problems in order to proceed more intelligently in breeding operations.

Biology of cattle, W. WILSON (*Verhandl. Internat. Zool. Kong. Graz*, 8 (1910), pp. 939-948).—Brief discussions are given of factors concerned in the domestication of cattle, the adaptability of certain breeds for special purposes, and tendencies in the improvement of our breeds of cattle.

Inheritance of the poll character in cattle, W. J. SPILLMAN (1913, pp. 8, figs. 3).—This is a paper read at the annual meeting of the American Polled Jersey Cattle Company, 1913, on the practical value of Mendelism as applied to the inheritance of horns in cattle.

The relation between body measurements and the weight of the heart and lungs in the Chiana breed of cattle and a comparison between the Chiana and the Romagna breeds, C. PUCCI (*Mod. Zootatro*, 1910; *Jahrb. Wiss. u. Prakt. Tierzucht*, 7 (1912), pp. 117-131, figs. 5).—As a result of measurements it is concluded that the absolute weight and the relative weight of the lungs and heart is on the average greater in the oxen of the Romagna breed than in the Chiana. Other conclusions in regard to comparative measurements of form are given.

Contribution to our knowledge of the Tarentaise cattle from a zootechnical and industrial standpoint, P. HOFFMANN (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien*, 1 (1913), No. 3, pp. 309-337, pls. 3).—This discusses the origin, characteristics, and value for meat and milk production of this breed of cattle. They are especially adapted to dry climates, and their strong constitution makes them valuable animals for crossing with improved types.

The author is inclined to think that they are descendants of the original cattle of the ancient pile works of Switzerland, somewhat modified by environment, and not as thought by Boucher^a a cross between the Jurassic and Alpine breeds. Measurements of a number of animals are given.

On the determination of hemoglobin in cattle, DETTWEILER (*Fühling's Landw. Ztg.*, 61 (1912), No. 6, pp. 193-206).—The blood of cattle at pasture and

^a Jour. Méd. Vét. et Zootech., 53 (1902), pp. 214-224, 257-271, 335-347.

those of superior conformation was found to contain more hemoglobin than in stall fed or inferior animals.

Economic importance of corn silage in southern beef production, R. S. CURTIS (*North Carolina Sta. Rpt. 1912*, pp. 41-46).—A résumé of experiments at North Carolina and other stations, showing that in beef production silage is an important factor in cheapening the ration.

A contest in wool, C. S. PLUMB (*Country Gent.*, 78 (1913), No. 10, p. 345, fig. 1).—A brief historical account of public shearings in the United States. The educational features of such demonstrations are pointed out, and the method of scoring contests at the Ohio State University is given.

The Mocha goatskin trade of Red Sea region, W. H. SCHULZ (*Daily Cons. and Trade Rpts. [U. S.]*, 16 (1913), No. 77, pp. 49-51).—This is a report of the amount, value, and character of various grades of goatskins exported from Aden to the United States.

The utilization of feeding stuffs by the zebu, C. PUCCI (*Agr. Colon. [Italy]*, 7 (1913), No. 1, pp. 11-28, figs. 2).—Digestion coefficients were obtained with 1 bull and 1 zebu on a ration of hay and on hay and peanut cake. The differences between the 2 animals were slight, except in the case of ether extract, which was much better utilized by the zebu.

Pork production, J. I. THOMPSON (*California Sta. Circ. 96*, pp. 2).—Brief notes on the type of the hog market demands, and on the selection of breeding stock, and methods of feeding hogs, are given.

Cooperative pig-fattening establishment for Ulm and Neu Ulm, VON BRAUN (*Landw. Jahrb. Bayern*, 2 (1912), No. 3, pp. 121-167, figs. 5; abs. in *Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 6, pp. 1364-1366).—An account of the methods of a large pig-breeding co-operative association. Young pigs are fattened on fresh barley, meat meal, and fish meal until they reach the live weight of about 240 lbs. For the production of 100 lbs. of live weight it requires about 350 lbs. of fresh barley and 30 lbs. of the meat meal and fish meal. About 22 weeks are required for fattening, and the cost of the food ranges from 61.23 marks (about \$14.57) to 68.82 marks.

Biological searchlight on race-horse breeding, J. B. ROBERTSON (*Bloodstock Breeders' Rev.*, 2 (1913), No. 1, pp. 7-16, figs. 3).—This contains data on breeding records, mortality of twins, and other data connected with twinning in Thoroughbred brood mares.

The Arabian national stud book (*Washington, D. C.*, 1913, vol. 1, rev. ed., pp. 88, pls. 13).—Besides a list of American Arabian horses, this contains notes on the history of the Arabian horse and information relating to the Arabian Horse Club of America.

The home poultry book, E. I. FARRINGTON (*New York*, 1913, pp. 172, pls. 32).—The information in this book is based largely on personal experience and on what has been learned by visits to large poultry plants. It is intended for those who keep poultry on a small scale.

Castration in relation to the secondary sexual characters of Brown Leghorns, H. D. GOODALE (*Amer. Nat.*, 47 (1913), No. 555, pp. 159-169, figs. 3).—In castration of male Brown Leghorns all characters of the cock were retained by the capon, with the exception of comb character. The comb resembled that of a pullet just before beginning to lay. Ovariectomy caused the female to assume some of the feather characteristics of the male.

On the origin of double-yolked eggs, O. GLASER (*Biol. Bul. Mar. Biol. Lab. Woods Hole*, 24 (1913), No. 3, pp. 175-186, figs. 3).—Among the striking features of an abnormal ovary of a White Leghorn hen which had a habit of laying double-yolked eggs were compound follicles, apparently budding follicles,

and the attachment of many medium sized follicles to the main mass of the ovary by means of suspensoria.

The laying competition at Storrs (*Farm Poultry*, 24 (1913), No. 4, pp. 99-101, figs. 5).—A discussion of the value of laying competitions in general, and of a test at the Connecticut Storrs Station in particular. Doubt is cast upon the accuracy of the records of some foreign competitions which have been previously noted.

From an examination of the birds in the competition at Storrs, it is concluded that the big records obtained are due to the condition of the bird and not to the breed or strain of stock. "The one thing in which the English competitors (the men) plainly excel the American is in handling their birds to have them fit to make a flying start at a certain time after 2 weeks on the road. It would be worth a great deal more to the American breeder to know how to do this than to have their stock."

Farm poultry and egg marketing conditions in Ontario County, J. H. HARE and T. A. BENSON (*Ontario Dept. Agr. Bul.* 208, 1913, pp. 31, figs. 11).—This is a report of methods in the feeding and management of poultry and the marketing of eggs as practiced by farmers in Ontario.

Export of eggs (*Jour. New Zeal. Dept. Agr.*, 5 (1912), No. 6, pp. 671, 672).—This contains the details of an experiment in shipping eggs from New Zealand to Vancouver, B. C.

Poultry work at Oregon Experiment Station, A. F. HUNTER (*Rel. Poultry Jour.*, 20 (1913), No. 2, pp. 226, 227, 277-280, figs. 7).—A popular account of the value to practical agriculture of the investigations and methods of poultry instruction at the Oregon Station.

Dedication of \$90,000 poultry building, MYRA V. NORRIS (*Rel. Poultry Jour.*, 20 (1913), No. 2, pp. 229, 259-263, figs. 4).—Plans of the poultry husbandry building at Cornell University are given, together with a brief description of the equipment for giving instruction and carrying on investigations in poultry.

Fur-bearing mammals: An unappreciated natural resource, W. P. TAYLOR (*Science*, n. ser., 37 (1913), No. 952, pp. 485-487).—Attention is called to the economic value of the fur-bearing mammals of North America, which will decrease annually unless measures are taken to prevent the extinction of several of the most valuable species.

Mink farming, A. S. WHITE (*Pine River, Minn.*, 1913, pp. 15, pl. 1, figs. 5).—This contains information on the care, feeding, and management of minks, and is written for those interested in "fur farming."

Results of German animal census, A. M. THACKARA (*Daily Cons. and Trade Rpts.* [U. S.], 16 (1913) No. 70, pp. 1484, 1485).—The results of the provisional census of 1912 show a decrease since 1907 in the number of beef cattle, swine, sheep, and goats, and an increase in horses, mules, asses, fowls, and beehives. There was a decrease in the number of all kinds of animals slaughtered in public abattoirs over the previous year, except in sheep, horses, and dogs.

DAIRY FARMING—DAIRYING.

Dairy herd records (*U. S. Dept. Agr., Bur. Anim. Indus. Bul.* 164, pp. 57).—These records, prepared from data collected by W. D. Hoard, cover a period from 1899 to 1908, inclusive, and include 26 districts of 13 of the principal dairy States in Eastern and Central United States. Data on 2,163 herds containing 28,447 cows are presented in tabular form. The method of conducting the canvasses was varied to meet local conditions, but the general plan was to include in each canvass a sufficient number of representative herds to show fairly the equipment and practice prevailing in the territory covered. A cow

was usually credited only with the value of her whole milk and butter or milk fat, while the value of her skim milk, calf, manure, and final value as beef were not entered to her credit as these items are commonly balanced by labor, housing, interest, insurance, and depreciation.

The following statement summarizes the various features detailed in the tables, showing in each case the average total results for all the canvasses, also, the differences in favor of the more progressive dairymen.

Dairy herd records, 1899-1908.

Features.	Number of herds.	Number of cows.	Yearly cost of feed per cow.	Pounds of milk yearly per cow.	Pounds of butter yearly per cow.	Pounds of butter fat yearly per cow.	Returns for \$1 worth of feed.	Net profit per cow yearly.	Food cost of milk per 100 lbs.	Food cost of butter per pound.	Food cost of butter fat per pound.	Profitable herds.	Unprofitable herds.
Total of canvasses.....	2, 163	28, 447	\$33.43	4, 213	196	158.4	\$1.24	\$8.11	\$0.802	\$0.148	\$0.213	1, 531	632
Herds of good dairy type.....	652	9, 365	33.95	5, 104	240	189.0	1.51	17.38	.656	.122	.185	597	55
Herds lacking dairy type.....	685	8, 104	32.01	3, 550	162	138.2	1.06	2.03	.908	.178	.23	379	306
Difference in favor of dairy type.....			-1.94	1, 554	78	50.8	0.45	15.35	.252	.056	.045		
Herds fed silage.....	329	6, 689	34.98	4, 760	230	181.8	1.39	13.50	.747	.129	.189	282	47
Not known to be silage fed.....	1, 834	21, 758	32.95	4, 045	186	151.2	1.20	6.46	.822	.155	.222	1, 249	585
Difference in favor of silage.....			-2.03	715	44	30.6	.19	7.04	.075	.026	.033		
Herds in good stables.....	639	9, 506	34.53	4, 793	240	180.0	1.41	14.12	.75	.124	.187	553	86
Herds in poor stables.....	323	3, 775	32.53	3, 514	164	130.0	1.01	0.23	.927	.177	.266	153	170
Difference in favor of good stables.....			-2.00	1, 279	76	50.0	.40	13.89	.177	.053	.079		
Herds whose owners read dairy literature.....	464	6, 202	34.78	4, 809	207	185.0	1.42	14.54	.775	.146	.175	411	53
Herds of nonreaders.....	753	9, 122	35.00	3, 584	165	136.7	1.05	1.85	.918	.177	.288	392	361
Difference in favor of readers.....			0.22	1, 225	42	48.3	.37	12.69	.143	.031	.113		
Herds most profitable....	268	3, 848	33.66	5, 690	271	234.0	1.78	26.18	.595	.105	.145	268	0
Herds least profitable....	267	3, 459	33.76	2, 973	143	102.2	.80	-6.70	1.167	.211	.321	44	223
Difference in favor of most profitable.....			.10	2, 717	128	131.8	.98	32.88	.572	.106	.176		

Advantages to the breeder in testing his pure-bred cows for the register of merit, CORA J. HILL (*California Sta. Circ.* 88, pp. 2).—A brief statement of the value of making official records of individual cows.

Detecting dairy losses, L. M. DAVIS (*California Sta. Circ.* 95, pp. 2).—The use of milk scales and the Babcock tester is advocated.

Increasing dairy profits, H. E. VAN NORMAN (*California Sta. Circ.* 97, p. 1).—The means suggested are better cows and improved methods of feeding.

Care of milk and cream on the farm, J. H. FRANDSEN (*Nebraska Sta. Bul.* 133, pp. 3-12, figs. 5).—This contains information on the care of milk and cream, cleansing dairy utensils, and other matters relating to the production of milk and cream.

The dairyman's relation to quality, L. M. DAVIS (*California Sta. Circ.* 94, pp. 2).—The necessity for cleanliness in the production and handling of milk and milk products is pointed out.

Factors influencing the change in flavor in storage butter, L. A. ROGERS ET AL. (*U. S. Dept. Agr., Bur. Anim. Indus. Bul.* 162, pp. 69, fig. 1).—This bulletin reports a study of some of the factors which affect the flavor of storage butter. There is also a brief review of previous work on this topic.

From a study of proteolysis in storage butter, determined by different methods and including a proposed method described in detail, it was evident that proteolysis did not take place to any appreciable extent in the samples studied, nor was there any relation between the figures for nitrogen and the butter scores. Buttermilk from sweet, unpasteurized cream and from sweet, pasteurized cream when preserved with 18 per cent sodium chlorid to correspond to butter curd solution showed no proteolysis during a long period in cold storage. Sodium chlorid did not inhibit proteolysis in sterilized skim milk stored at 20° F. (-7° C.), if a large quantity of proteolytic enzymes of bacterial origin was present. Butter made from sweet, pasteurized cream kept better than butter made from similar cream without pasteurization, but the changes in unpasteurized cream butter could not be produced by reinoculating the pasteurized cream with the bacteria of the cream before pasteurization.

A preliminary report is made of a study of the possible oxidation of butter by inclosed air. About 10 per cent by volume of fresh butter was found to be a gas consisting approximately of nitrogen 33 per cent, oxygen 20 per cent, and the remainder gases absorbable by sodium hydroxid. The percentage of oxygen was materially less after storage. Overworked butter did not contain any more air than that which had been normally worked.

In studying the effects of metals, known amounts of iron were added to cream, and although there seemed to be no definite relationship between the amount of iron added to cream and the amount found in butter, buttermilk, and wash water, yet a relatively small part of the iron went into the butter as compared with the buttermilk, which seemed to take most of the iron, and in which the presence of the flavor due to the iron was most noticeable. The addition of iron to cream, even in as small an amount as 1 or 2 parts per million parts of cream had an influence on the flavor of the butter. Whenever butter was made from cream which had stood in contact with iron rust it had a peculiar taste and could be easily picked out from a lot of samples.

"The cream may take up iron in quantities sufficient to affect the flavor from rusty cans or even from the exposed bolt heads or other metal parts of the churn. . . . It was found that in milk to which 18 per cent sodium chlorid had been added there was no change in the lactose when iron was added and a current of oxygen passed through the milk for 72 hours." This indicated that the naturally occurring peroxidase could not utilize molecular oxygen for the oxidation of lactose.

On the assumption that organic peroxids might be formed in butter, and that such peroxids might be used by the peroxidase present for oxidation, a few experiments were made in which the polarization of skim milk was observed before and after the addition of hydrogen peroxid, with and without iron. There was an appreciable lowering in the polarization in mixtures containing hydrogen peroxid and iron. The tentative conclusion drawn is that the lactose was oxidized by the action of the peroxid and iron, and if there were peroxid formation in butter such oxidation of lactose might take place there. In presence of lactic acid, or its combination with casein, the lactose present might be inverted, and the iron and oxygen would have the entire storage period in order to bring about the slight chemical changes that would cause an off flavor. Ferrous salts were more active in the production of a strong odor than ferric salts.

The iodoform test was much stronger in distillates from milk containing ferrous sulphate. "While these results do not prove that the iodoform was obtained from oxidation products of milk protein, they do prove the possibility of such oxidation. By distilling such mixtures under low pressure and at low temperature to remove the possible objection that the temperature of distilla-

tion is not the temperature at which chemical changes take place in storage butter, the identity of the iodoform reacting substances could without doubt be ascertained. Whether the small amounts of iron ordinarily present in butter can slowly bring about the same kind of a change that larger amounts of iron bring about in milk in a very much shorter time is to be determined by future investigation."

Butter made from cream to which copper sulphate had been added showed a fishy flavor after a storage of 40 days, and after 3 months of storage a decided mackerel flavor. One experiment was made with cream ripened in contact with 2 sheets of bright copper, and another in which the cream came in contact with a large surface of copper for a short time. Fishy flavors developed in both cases. Both tests showed very plainly "the deteriorating effect of poorly tinned pasteurizers, for aside from this all other conditions were exactly alike during the complete process of butter manufacture. Considering the short duration of contact, the change in the flavor of the butter even when fresh is very marked. The effect of copper even in small amounts seems to cause more marked changes in butter flavor than iron, with a marked tendency toward a fishy flavor in storage."

A study of the bacteria which survive pasteurization, S. H. AYERS and W. T. JOHNSON, JR. (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 161, pp. 66, figs. 30*).—A study of bacteria which survive the temperature at which milk is usually pasteurized, undertaken since those which survive form the foundation for subsequent bacterial development.

In reply to circular letters it was found that the temperatures at which milk is usually pasteurized are extremely variable. "The average temperature used throughout the country with the 'holder' process is 62.8° C. (145° F.), with the 'flash' process, 71.1° C. (160° F.).

"Reports from 219 milk plants show that 75 used the 'holder' and 144 the 'flash' process. The range in temperatures is from 60° C. (140° F.) to 82.2° C. (180° F.). Of the plants using the 'holder' process only 1.3 per cent employ temperatures too low for proper pasteurization. Of those which use the 'flash' process approximately 42 per cent use temperatures too low to be effective."

Most of the experiments of the authors were made at temperatures of 62.8° C. for 30 minutes, as this was the average temperature for the "holder" process. Higher temperatures in some cases were used in order to show changes in the bacterial groups which survived.

Percentage bacterial reduction is considered of no value in determining the efficiency of the process of pasteurization. As a general rule when the bacterial content of raw milk is high there will be a high percentage reduction and vice versa when the bacterial content is low.

"A heating period of 3 hours causes a marked increase in the reduction of bacteria in milk over one-half hour's heating, when a temperature of 54.4° C. (130° F.) and 57.2° C. (135° F.) are used. At 60° C. the increased reduction is much less. According to the results of one experiment in this investigation, a 6 hours' period of heating at 62.8° C. does not produce any more destruction of bacteria than does one-half hour's heating.

"Sudden cooling from 62.8° or 71.1° C. within 15 seconds to from 1.7°–3.9° C. (35°–39° F.) does not cause any destruction of bacteria. The long-prevailing idea that sudden cooling is an essential part of the process of pasteurization is erroneous so far as any increased destruction of bacteria is concerned. Its value lies only in the fact that milk suddenly cooled is not allowed to stand at temperatures between 37.8° C. (100° F.) and 10° C. (50° F.), where rapid bacterial development might occur.

"Four distinct groups of bacteria, the acid-forming, the inert, the alkali-forming, and the peptonizing, survive pasteurization, as differentiated by their reactions in litmus milk after 14 days' incubation at 30° C. (86° F.).

"The percentage of the acid group is increased by pasteurization while the other groups are decreased in their percentage of the total bacteria. The average percentage of lactic acid bacteria in raw milk which survive pasteurization for 30 minutes at 62.8° C. ranges from 1.27 per cent to 4.55 per cent in the various grades of milk.

"When the temperature of pasteurization is below 76.7° C. (170° F.) the bacterial flora of milk is composed for the most part of organisms of the acid group. At temperatures above 76.7° C. the acid group is largely destroyed and the majority of the bacteria which survive are of the peptonizing type. These bacterial group relations are clearly shown.

"When different grades of milk are pasteurized at 62.8° C. in the laboratory and held at room temperature the bacterial flora may undergo three distinct changes. First, when a fair quality of milk is pasteurized the acid group may develop at once and overgrow all the other groups, forming acid and producing a normal curd. Second, when a poor quality of milk is pasteurized the peptonizing group may grow rapidly at first along with the acid group, which later overgrows them. In this case the milk will first become curdled with a rennet curd due to the peptonizing bacteria, then later will become sour from the development of the lactic-acid group of organisms. Third, when a good grade of milk is pasteurized the peptonizing bacteria may overgrow the acid group of organisms so that the milk becomes peptonized without the development of any acid. These same grades of milk, treated in the same manner but held in an ice chest at 10° C., show entirely different changes in their bacterial contents. The growth of the peptonizing group is restrained so that they are of little importance. The percentage of the acid group remains about the same through a long period. Occasionally the percentage of the alkali group may increase after five days, but eventually the acid group forms the major group. These results were obtained from laboratory experiments and only indicate possible changes in the bacterial flora of pasteurized milk when held at different temperatures. They show the delicate balance between the bacterial groups, but can not be applied to indicate the bacterial changes in milk pasteurized and handled under commercial conditions.

"A qualitative study of the acid group shows that many organisms giving characteristics of the typical lactic-acid bacteria survive pasteurization for 30 minutes at 62.8° C. Other lactic-acid forming bacteria survive which may form pigment or vary from the typical lactic types in the fermentative reactions.

"The inert group was made of organisms which produce no change in litmus milk during 14 days' incubation, and therefore include many which did not grow, but which according to the method of differentiation would be included as inert forms. The only truly inert form recognized was a yellow pigment-forming organism. The inert group is probably of little importance.

"The alkali group which survive pasteurization is of importance. Bacteria of this group can not be differentiated from those of the inert group or from slow acid-forming organisms by plating, but are easily determined by the milk-tube method. They grow at low temperatures and produce a strong alkaline reaction in milk. In pure cultures enough alkali is produced to dissolve the casein. No acid is produced in fermentation broths, but often an alkaline reaction is found.

"The peptonizing group includes those organisms which peptonize casein. A number of the organisms isolated peptonized casein, but did not liquefy gela-

tin. Various types of this group are able to survive pasteurization and vary widely in their cultural characteristics.

"The few gas-forming bacteria in pasteurized milk, so far as the results of this investigation indicate, do not include organisms of the colon-aerogenes group. One gas-forming organism was found which produced gas in milk and peptonized casein. Another culture, known as Z, seems to be an entirely new type, which is characterized by its ability to produce gas continuously in milk through a long period, and by the fact that while gas is formed in milk none is formed in lactose broth.

"Gas-forming anaerobic bacteria are often found in milk which produce gas in lactose bile tubes and which might be mistaken in a preliminary test for the colon organism. In view of this fact, it seems advisable to suggest that boards of health which depend on the presence of the colon-aerogenes group as an indication of reinfection or inefficient pasteurization make a complete determination by cultural reactions of organisms suspected as being colon forms.

"The thermal death point of one lactic acid organism isolated during this investigation was 79.4° C. (175° F.) when a broth culture was heated in Sternberg bulbs for 30 minutes. The thermal death points of 64 acid-forming bacteria from one sample of milk which survived pasteurization for 30 minutes at 82.2° C. determined roughly was between 82.2° C. and 93.3° C. (200° F.).

"Only a small percentage of spore-forming bacteria are found in milk pasteurized for 30 minutes at 62.8° C. Of 225 cultures selected at random which were studied, only 3, or 1.35 per cent, formed spores.

"For those who advocate the inoculation of pasteurized milk, after heating, with a culture of lactic acid bacteria to produce a normal souring, it is suggested that a culture of a high-temperature resisting lactic-acid organism may be added before pasteurization. By such a method there would be no danger of infection as might result accidentally by inoculation after pasteurization.

"In view of the results of this investigation it seems that the control of pasteurization should be maintained by bacterial limits for the milk to be pasteurized, together with supervision which will insure the use of the proper pasteurizing temperature and guard against reinfection. A bacterial standard then need not be set for pasteurized milk."

A comparison of the acid test and the rennet test for determining the condition of milk for the Cheddar type of cheese, E. G. HASTINGS and ALICE C. EVANS (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 210, pp. 6*).—In order to determine the error in testing the acidity of milk by the titration method, known quantities of acid were added to milk and the average error was found to be 0.01 per cent, even when 50 cc. of milk was titrated. With a less experienced operator, working under conditions that exist in cheese factories, the error would be at least twice this amount, as was determined by actual trial.

That the bacterial content of milk can not be determined by the acidity was shown by the following test: A sample of milk having an acidity of 0.17 per cent was divided into 2 portions. To one portion rennet was added; the second was kept at 86° F. for 1 hour. At the end of this period the acidity was still 0.17 per cent, but the bacterial content must have been several times greater than in the first sample.

As an illustration of the superior sensitiveness of the rennet test, one sample was curdled in 3 minutes 30 seconds with rennet, while milk originally from the same sample, after incubating for 4 hours 45 minutes, was curdled by rennet in 1 minute 30 seconds. The difference in the acidity of the 2 milks, however, was only 0.018 per cent, the difference being within the limits of error of titration. The rennet test closely paralleled the change in bacterial content.

VETERINARY MEDICINE.

Studies in cotton-seed meal intoxication.—I, As to pyrophosphoric acid, W. A. WITHERS, B. J. RAY, ET AL. (*North Carolina Sta. Rpt. 1912, pp. 141-145; Jour. Biol. Chem., 14 (1913), No. 2, pp. 53-58*).—Feeding through a catheter the concentrated filtrate from raw cotton-seed meal, digested 1 day each with pepsin and pancreatin, was found to be generally toxic to rabbits. The amount fed, however, corresponded to from 15 to 20 times the amount of meal usually taken by these animals. Feeding an amount of pyrophosphoric acid, corresponding to the amount of phosphorus (calculated as P_2O_5) present in the cotton-seed meal extract, was also toxic.

“The pepsin-pancreatic residue is more toxic than the aqueous or pepsin-pancreatic extracts of the meal; in fact, it is the only one of the 3 fractions which is toxic under the conditions of the feeding.

A fraction of cotton-seed meal containing a nontoxic amount of pyrophosphoric acid may be toxic. The results indicate that pyrophosphoric acid is not the cause of toxicity of cotton-seed meal.

Feeding and toxicity of cotton-seed meal, R. S. CURTIS (*North Carolina Sta. Rpt. 1912, pp. 146-149*).—While cotton-seed meal when fed by an experienced stockman can be used with some profit, the author does not advocate its use by the average farmer as a feed for pigs. Swine fed on cotton-seed meal may thrive for a time, but later on an imperceptible reaction may take place, which puts the animals below par. While the animals are gaining in weight there does not seem to be any reason to anticipate a dangerous condition, but as many farmers do not possess scales, no method is at hand for ascertaining whether the animals are doing well or not. Premonitory symptoms of cotton-seed meal poisoning are not always marked. Much seems to depend upon how the cotton-seed meal from Sea Island seed is fed, and the method of manufacturing the meal also has some effect upon the toxicity. This has been shown by Crawford (E. S. R., 22, p. 502).

In a test of these points, 2 hogs were fed a ration of Sea Island cotton-seed meal from May 1, 1911, until November 24 without apparent ill effects. In taking the final weights, however, an attempt was made to drive the pigs from the small lot wherein they had been fed, when it was noticed that the exercise necessitated began to have a marked effect on the equilibrium of the body. “The hogs were finally driven from the smaller lot into a larger one where the increased exercise had a still greater effect on the stability of the body movements. One hog finally reached the scale chute, and just upon entering lost complete control of the body, fell on the side with an intense rigidity of the body, accompanied by a muscular quivering and jerking motion of the body parts. After a few long gasps for breath, life became entirely extinct. The original weight of this pig was 105 lbs., final weight 95 lbs., a loss of 10 lbs., although this condition of the animal would not have been suspected on casual examination. Following this most striking death the second pig was driven on the scales and within a few minutes the same condition became apparent as in the former one. The hog was weighed, driven part way down the scale chute when he also lost body control, and within 3 to 4 minutes died in the same manner as the former animal had done. The original weight of this pig was 115 lbs., final weight 145 lbs., showing a gain of 30 lbs. in the 208 days’ feeding period, which should have been ample for a 200-lb. gain under normal conditions of feed and management.”

A third hog, previously fed with Upland cotton-seed meal, was treated in the same manner described above, and when given some exercise, it became totally blind for a time, and lost entire control of the body. The animal died

1 year from the beginning of the experiments. Previous to its death it was affected with blind staggers, and slightly closed eyes, with a white exudate from them.

It is stated that the amount of cotton-seed meal recommended by Dinwiddie (E. S. R., 17, p. 280) as safe has been known to kill pigs at the North Carolina and other stations. This is illustrated by the records of some experiments. "Various treatments have failed to eliminate all or any appreciable part of the toxic property of the meal from a commercial standpoint. Steaming, roasting, boiling, souring, and fermenting have all been tried but without definite results from a practical view point."

[Report of the division of veterinary science], G. A. ROBERTS (*North Carolina Sta. Rpt. 1912, pp. 27-29*).—Thirty-five head of steers were fed a daily average of 7.5 lbs. of cotton-seed meal per steer from December 1 to April 5, or 127 days, with no ill effects. A yearling calf, weighing 175 lbs. at the beginning and 247.5 lbs. at the end, was fed from October 6 to the time of its death on July 9, a total of 702 lbs. of meal, but there was no gain in weight after the first 4 or 5 months. "The principal lesions found on autopsy of the calf consisted of slight excess of serous fluid in both abdominal and thoracic cavities, and considerable irritation of the intestines as indicated by marked injection of their mesenteric and visceral blood vessels. The fourth stomach contained considerable sand and gravel, indicating a depraved appetite. The lymph nodes were not found congested, as frequently reported by ourselves and others in cotton-seed poisoning. The liver and kidneys showed some congestion. The lungs showed congestion, hepatization, and some edema. The external blood vessels of the heart were injected; a small thrombus and considerable firmly clotted blood were found within the heart."

The symptoms in 13 hogs fed cotton seed and cotton-seed meal were observed from only a few minutes to 4 or 5 days before death. They consisted in loss of appetite, weakness, unsteady gait, more or less blindness, and some difficulty in breathing. The hogs in most cases would finally get down unable to rise and lie there in a more or less comatose condition for a few hours to 2 or 3 days before dying. The results of findings at post-mortem examinations of 7 hogs, 50 rabbits, and 2 guinea pigs are reported.

The identification of the woody aster (*Wyoming Sta. Bul. 97, pp. 4, figs. 3*).—This bulletin gives a brief description of the woody aster and where it grows, when it appears, the poisonous period, and symptoms after poisoning. A mounted specimen of the plant in bloom is included.

Disinfection on the farm, C. M. HARING (*California Sta. Circ. 91, pp. 3*).—A brief popular discussion of disinfection and disinfectants.

Trypanosomes and trypanosomiases, A. LEVARIAN and F. MFSNIL (*Trypanosomes et Trypanosomiases. Paris, 1912, 2. ed., rev., pp. VIII+999, pl. 1, figs. 198*).—A revised and enlarged edition of the work previously noted (E. S. R., 17, p. 81).

Fate of tubercle bacilli outside the animal body, C. F. BRISCOE (*Illinois Sta. Bul. 161, pp. 277-375, figs. 4*).—"In experiments to determine the time that tubercle bacilli live in various conditions, the chief difficulty is the 'index of death' for these germs. This is true since cultivation of the tubercle bacilli from contaminated material is not feasible, and since the dead germs produce, in test animals, tubercles indistinguishable by microscopic appearance from those produced by live tubercle bacilli.

"Pure cultures of nonspore-bearing organisms and the vegetative cells of spore-bearing germs when exposed to direct sunlight in thin smears are killed in from $\frac{1}{2}$ to 6 minutes; the human, bovine, and avian types of tubercle bacilli

exposed in the same way were killed in from 1 to 4 minutes. When exposed to desiccation in a dark, well-ventilated place, the nonspore-bearing organisms and the vegetative cells of spore-bearing organisms died in from 1 to 4 days; spores of *Bacillus subtilis* and *B. vulgaris* used as controls were not killed in 35 days; the human and bovine type of tubercle bacilli exposed at the same time and under the same conditions were dead within 4 and 8 days, respectively.

"Pure cultures of bovine tubercle bacilli mixed in cow manure and exposed in a 2-in. layer in a pasture field in the sunshine remained alive and virulent for 2 months. As would be expected, these germs exposed in cow manure retained their virulence longer in the shade than in the sunshine, as shown both by the greater severity of the disease produced in the guinea pigs inoculated with the germs exposed in the shade than that produced in the guinea pigs inoculated on the same day with the germs exposed in the sunshine, and by the greater length of time that the guinea pigs, which were inoculated with the germs exposed in the sunshine, remained alive. Tubercle bacilli in the manure of a naturally infected cow, exposed in the same manner as the artificially infected manure, were dead within 2 weeks after exposure.

"Tubercle bacilli in garden soil and in a dead tuberculous guinea pig, buried in garden soil, were alive on the two hundred and thirteenth and the seventy-first days, respectively, and dead on the two hundred and thirtieth and ninety-ninth days, after first exposed. Tubercle bacilli live for more than a year in running water. A watering trough harboring these germs may be a dangerous source of infection to cattle. The better disposition of dead tuberculous animals is to destroy by burning. Tubercle bacilli in drinking water is one of the possible sources of infection for man. Infection is not prevented by dilution, since clumps containing a great number of these organisms may be inclosed in mucoid material which prevents their separation and destruction.

"Tubercle bacilli in market butter placed in cold storage live for more than 10 months, which is a longer time than such butter is usually kept in storage."

This is followed by a general discussion which points out the relation the results have to tuberculosis in man, cattle, and hogs.

A bibliography embracing 160 titles is included.

Fate of tubercle bacilli outside the animal body, C. F. BRISCOE (*Cream and Milk Plant Mo.*, 1 (1913), No. 7, pp. 11-13).—Adequately noted above.

Tuberculosis in the university dairy herd, C. C. HAYDEN (*Illinois Sta. Bul.* 162, pp. 379-407, figs. 17).—In the spring of 1906 a grade cow, belonging to the herd, was found tubercular. A test was therefore made of 34 of the 44 animals and 13 reactors found among them. Five of the 13 reactors were slaughtered and post-mortems showed in every instance a nongeneralized tuberculosis. The other 8 animals were kept in the herd for a time and then slaughtered.

The remaining untested cows and a part of those previously reacting, 15 in all, were tested in December, 1906; 10 reacted, 5 of which had previously reacted. Seven of the reactors were slaughtered at this time.

"In June, 1907, the herd consisted of 55 females, including calves; 5 which were suspicious or had reacted were tested at this time; 2 of these reacted. The next test was made in May, 1908. There were then 67 females in the entire breeding herd. Fifty of these, or practically all that were considered old enough were tested. Of the 50 tested, 26, or 52 per cent, reacted and were removed from the herd. Among the reactors were some of the best cows in the herd. These, with a few others, were placed in quarantine to secure their progeny and for experimental purposes. The others were slaughtered.

"The next test was made in the fall of 1908. There were at that time 56 females in the herd, including 7 purchased; 36 which were old enough were tested,

and 3 which reacted were removed from the herd. The next test was made 1 year later, in the fall of 1909, when there were 78 females in the herd. Sixty-seven were tested and 4 reacted. In the spring of 1910 there were 72 females; 57 were tested and 1 reacted. In the fall of 1910 there were 77 females; 72 were tested, and none reacted. The following spring (1911) there were 88 females; of 70 tested 1 reacted but showed no evidence of tuberculosis when slaughtered, although a careful examination was made. In the fall of 1911 there were 96 females, 90 of which were tested, resulting in 1 reaction. The last test was made in March, 1912, at which time there were 95 females in the herd; 81 were tested, and 4 reacted. Despite the great loss, and with the addition of a few calves from the experimental herd, the number of females increased from 55 in 1907 to 91 clean females in March, 1912. During this time, 19 females were added to the herd by purchase and 32 nonreactors were sold. . . .

"Once a herd of mature animals becomes badly diseased, it is probably best to consider the entire herd affected and treat it accordingly. In the breeding herd 170 different females have been tested, and 50, or about 30 per cent, reacted. . . .

"[With reference to the] bulls, between May, 1906, and December, 1911, 5 mature bulls and 32 young ones, ranging in age from 6 months to 2 years, were tested, and 3 reacted. . . . Only 1 young bull reacted. With other calves, he was fed on milk from the quarantined herd. The milk was supposed to have been sterilized before feeding, but this may not always have been perfectly done."

Figures are presented which show the approximate value of 19 pure-bred reacting cows which were quarantined in 1908 and 4 others which were added later before becoming tubercular; the tests made; the findings on post-mortem; and the receipts for the value of the carcass, milk, and progeny. "The quarantined herd was kept in existence for about 2 years at a cost of \$60 per head per year, or a total cost of about \$2,700 for the 2 years. The gross returns during that time were approximately \$4,436, making a net return of \$1,736. It is probable, however, that the cost under these conditions was greater than it would be in an ordinary herd."

Data are given which show the possibility of obtaining clean calves from infected dams.

"Between June, 1906, and 1910, 41 cows were purchased for experimental purposes without being previously tested. Twenty-two of these, or over 50 per cent, reacted. In 1 group of 14 cows selected from 7 herds in the northern part of Illinois, all but 1 proved to be tuberculous. All the 41 except 8 came from the northern part of the State, and most of them originally from Wisconsin." The results show the existence of the disease in the dairy sections of the country, and the channels through which it is spreading.

From May, 1906, to March 31, 1912, 90 animals were slaughtered. Of these, 75 were reactors, and of the reactors 60 were shown to be tuberculous, 4 were doubtful, and 11 were apparently free from the disease. Of the 4 which were doubtful, 2 had diseased udders and 1 was affected with chronic scours. Of the 15 nonreactors (among which there were 2 animals which were not tested and 2 which gave doubtful reactions) 10 were found sound on slaughter.

Preceding the above material is a discussion of the nature of the disease, the symptoms, the tuberculin test, its accuracy, vaccination against tuberculosis, and methods of handling diseased animals. The text of a bill introduced into the Illinois legislature in 1909 providing state aid is appended.

Tuberculosis in cattle and hogs, C. M. HARING (*California Sta. Circ. 90, pp. 4*).—A popular account, showing the enormous losses sustained from bovine

tuberculosis and its relation to human health, and the infection of hogs, and discussing the symptoms of tuberculosis in cattle, post-mortem appearances of tuberculous cattle, methods of suppressing the disease, and dairy sanitation.

On the infectious abortion of the cow, ZWICK and ZELLER (*Arb. K. Gsndhtsamt.*, 43 (1912), No. 1, pp. 1-129, pls. 2).—The authors find contagious abortion among cattle in Germany to be largely due to Bang's bacillus. *Bacillus pyogenes* was found to be the cause in but one case. The abortion bacillus brings about a fibro-purulent inflammation of the maternal and fetal placenta. In aborted fetuses the changes are found principally in the stomach and intestinal canal. It is comparatively easy to cultivate the bacillus from the muco-purulent content of the abomasum or of the intestines of aborted fetuses, also from parts of the afterbirth so long as they are kept in a fresh condition. The bacillus does not take an exceptional position between the aerobes and anaerobes as described by Bang, but usually develops much more readily under aerobic conditions. Taken directly from the fetus, the authors frequently succeeded in cultivating it aerobically on agar slants. Infectious vaginal catarrh is not considered to be a cause of abortion.

The details of anatomical changes and of agglutination and complement fixation tests are included in the report.

Biological investigations of the abortion bacillus, ZWICK and WEDEMANN (*Arb. K. Gsndhtsamt.*, 43 (1912), No. 1, pp. 130-144, figs. 6).—A detailed report on cultural studies, resistance of the bacillus to heat, disinfectants, etc.

The abortion bacillus is destroyed by sterile urine beginning at the end of one day, but survives for more than 75 days in sterile moist feces. In dry feces it survives for but a very short time. In culture it is destroyed by a 3 per cent cresol-sulphuric acid solution within from 5 to 10 minutes, and by a hydrochloric acid-sodium chlorid solution containing 1 per cent of the former and 8 per cent of the latter within 15 seconds at 20° C.

Infectious abortion and sterility in cattle, W. GILTNER (*Michigan Sta. Tech. Bul.* 14, pp. 3-12).—The author states that as a result of the use of liquid cultures of lactic organisms as a substitute for coal-tar disinfectants about 50 per cent of the cases treated conceived after only a few treatments. Work on the bacterial flora of the vagina does not indicate that the lactic organism establishes itself in the vaginal mucosa and that an undue acidity of the mucous membrane is not produced. In the cultivation of *Bacillus abortus* an amniotic fluid media gave the best results.

Immunity experiments are reported. In an agglutination test of a heifer inoculated with 65 cc. of a culture of *B. abortus* on June 8, the agglutinative power of the blood serum increased in 7 days from 1:10 to 1:250, whereas the blood of an untreated heifer showed practically no change in agglutinative power. The temperature reaction from the injection began about 17 hours after the injection, reached its maximum 26 hours after the injection, and resumed the normal condition only after 5½ days, although it remained at an elevation of 103° F. or above for only 2 days.

On June 15 the treated heifer was injected with 130 cc. of culture one month old. Four hours after this injection the temperature was found to be considerably elevated, reaching its maximum at the end of 28 hours, and resuming the normal condition 3 days after the injection.

Tests made of the 2 heifers on November 8 after they had spent the summer at pasture gave with the treated heifer a complete agglutination at dilutions of from 1:10 to 1:250 and with the untreated from 1:10 to 1:50. Both heifers were injected on November 8 with 10 cc. of culture and again on February 16, with but slight temperature reactions and both calved normally the middle of April. "No deductions can be drawn from this experiment

except it be that injections of living abortion bacilli, unless more virulent than the strain employed by us, may be made either intravenously or subcutaneously with impunity on cattle either pregnant or nonpregnant."

Two tables are appended which record the temperature readings and other effects resulting from the injections of abortin. They direct attention to the weakness of the abortin test as a diagnostic. The author suggests the advisability of making parallel tests with the agglutination test, complement fixation test, and with abortin.

Infectious abortion and sterility in cows, C. M. HARING (*California Sta. Circ.* 92, pp. 4).—A brief popular discussion.

Johne's disease in sheep, F. W. TWORT and J. L. Y. INGRAM (*Vet. Rec.*, 25 (1913), No. 1292, p. 635).—The authors find that Johne's bacillus can be isolated from naturally affected sheep on the same media that they have used for the cultivation of the bacillus from cattle (E. S. R., 26, p. 783). Johne's bacillus isolated from cattle will reproduce Johne's disease in sheep. Sheep (like cattle) suffering from Johne's disease give a marked reaction when inoculated with a diagnostic vaccine prepared from cultures of Johne's bacillus.

Concerning piroplasmiasis of sheep, S. von RÄTZ (*Centbl. Bakt.* [etc.], 1. Abt., Orig., 68 (1913), No. 2, pp. 194-200, figs. 2).—The author's investigations have shown that "carceag," or piroplasmiasis of sheep, occurs in Hungary. It appears in an acute, malignant form, and also in a chronic or latent form, which in many cases presents no characteristic pathological changes.

On sarcosporidiosis (*Sarcocystis tenella*) in sheep in Scotland, J. P. McGOWAN and T. RETTIE (*Jour. Path. and Bact.*, 17 (1913), No. 3, pp. 422, 423; *Vet. Jour.*, 69 (1913), No. 453, pp. 102, 103).—The symptoms observed in an animal suffering from "scrapie" are described as great emaciation, pruritus (wool rubbed off and ulcers on nose, top of head, and legs; bare callosities at root of tail and on either side of it; attempting to bite the hand used to pinch its side; rubbing against walls, fences, etc.); bleaching of wool over the back; falling out of wool, especially on the flanks; and persistence of appetite. A secondary anemia was present; eosinophils were slightly increased in number. The temperature varied within the limits normal to the sheep, 39 to 40° C.

Post-mortem examinations of 4 animals revealed to the naked eye nothing in most cases except strongylosis of the lung and alimentary canal. The only lesion common to all the animals was a marked sarcosporidiosis, which was not detected by the naked eye, but was first noticed on microscopic examination of the muscles. The case in which the above mentioned symptoms were observed was thoroughly examined with the low power. "Sarcosporidial cysts were easily found in the first piece examined of muscles from the following situation: Panniculus carnosus, jaw muscles, facial muscles, tongue muscles, pharyngeal muscles, laryngeal muscles, deep and superficial muscles of neck (back and front), esophagus, muscles of scapulæ, of fore legs, intercostals, vertebral muscles, heart, diaphragm, muscles of wall of abdomen, and muscles of pelvis and lower limbs. About a hundred pieces of muscle in all were examined. Sarcosporidial cysts were not found in nonstriated muscle fibers, i. e., wall of alimentary canal, the uterus or vagina. In none of the sheep were there any macroscopic sarcosporidial lesions in the esophagus. . . .

"Taking into consideration the fact that in each of the 4 cases examined sarcosporidiosis was present, and that in each we had the opportunity of making a most complete examination—it was not only the only lesion present, but one distributed through the whole body—we put forward as a suggestion for future work that the disease 'scrapie' may be a syndrome that appears when a sheep is dying of a mass infection with *S. tenella*. The sarcosporidiosis may not be necessarily in itself during the economic life of the sheep, but in cer-

tain individuals owing to mass infection, it may assume a fatal character. The pruritus might be explained either by the toxin of the sarcocyst ('sarcocystine' is the only toxin so far isolated from a protozoan) acting on the central nervous system, or by the presence of the cysts in the muscle fibers causing a constant stimulation of the reflex, or by their presence causing an uneasiness in the muscle and inducing the animal to rub."

What is the antigen responsible for the antibodies in Dorset-Niles serum? W. GILTNER (*Michigan Sta. Tech. Bul.* 13, pp. 3-16).—Aside from the fact that the Dorset-Niles serum has been shown to possess protective powers against hog cholera, it has not been demonstrated to contain antibodies. It has been previously studied with reference to its agglutinative action on *Bacillus cholerae suis* (E. S. R., 26, p. 785), and although this bacillus is not considered the etiologic factor in the disease, it has been shown that there are protective substances present in the serum against virulent cultures of this organism. Consequently this blood is supposed to contain frequently both *B. cholerae suis* and the filterable virus, probably 2 distinct antigens.

In the experiments now reported, "3 pigs were hyperimmunized by injections of (a) *B. cholerae suis* mixed with pig blood free of the filterable virus, (b) pure cultures of *B. cholerae suis*, and (c) the filtered virus free of *B. cholerae suis*, respectively. The serum from the pig hyperimmunized with *B. cholerae suis* mixed with blood protected a 20-lb. pig in 20 cc. dose, and a 25-lb. pig in 25 cc. dose. This serum also agglutinated *B. cholerae suis* at a dilution of 1:12,500. The serum from the pig hyperimmunized with pure cultures of *B. cholerae suis* furnished no protection to a 15-lb. pig in doses of 20 cc. This serum agglutinated *B. cholerae suis* when diluted 1:500,000. The pig hyperimmunized with the filtered virus, free of *B. cholerae suis*, furnished a serum capable of protecting a 17-lb. pig in 10 cc. dose against the filtered virus, and an 18-lb. pig in 15 cc. dose against the unfiltered virus. This serum also agglutinated *B. cholerae suis* when diluted 1:8,000."

According to this, upon filtering hog-cholera serum through a Chamberland filter, something is removed which has much to do with producing hog cholera. Perhaps the serum is only allowed to pass through, and most of the ultra-microscopic organisms are retained in the filter. Mixing the Dorset-Niles serum and hog-cholera virus in vitro and incubating for 2½ to 3 hours does not seem to lessen the potency of the virus. There is, therefore, no indication that mixing serum and virus in vitro has any advantage over the serum-simultaneous method of giving these agents to pigs in immunizing against hog cholera.

Hog cholera and its prevention, C. M. HARING (*California Sta. Circ.* 89, pp. 4).—A popular account of the nature of hog cholera and how to deal with it.

Some animal parasites of the Miami County hog, D. C. MOTE (*Ohio Sta. Bul.* 256, p. 254).—An examination made of 15 hogs at time of slaughter revealed the presence of lung worms, ascarids, and small round worms in the large intestine.

The life history of *Habronema muscae*, a parasite of the horse transmitted by the house fly, B. H. RANSOM (*U. S. Dept. Agr., Bur. Anim. Indus. Bul.* 163, pp. 36, figs. 41).—This is a detailed report of studies, an abstract account of which has been previously noted (E. S. R., 26, p. 255).

A historical discussion of the subject is followed by a report of the frequency of the larval worms in flies, number of larval worms in individual flies, location in the body, experiments with larvæ removed from flies, survival of larvæ in dead flies, escape of larvæ from flies, and a detailed account of the development of the parasite.

In examinations of 137 flies for the presence of this parasite, 39, or 28 per cent, were found to be infested. At Washington, D. C., 4 out of 27 examined

were infested, at Colorado Springs 30 out of 91, and at Bancroft, Nebr., 5 out of 19. Of 137 pupæ examined 23, or 17 per cent, were found to be infested. Eight was the largest number of worms found in a single fly. The author's observations show that the worms may survive in flies for at least 2 days after the death of their host. "The embryos are active and motile when alive. Undoubtedly they pass out of the body of the horse in the feces. Whether they undergo further development before entering fly larvæ has not been determined, nor has it been determined whether they forcibly enter the intermediate host or whether they are passively swallowed." Six larval stages are described.

The adult *H. muscæ* is shown to be very similar to *Spiroptera microstoma*, known since 1866 as a parasite occurring in the stomach of the horse, but is a distinctly different species. Since the 2 species are congeneric the latter takes the name *H. microstoma*. The author considers it probable that *H. microstoma* has a life history similar to that of *H. muscæ* and that the form from *Stomoxys calcitrans*, called *Filaria stomoxeos* is the larval stage of *H. microstoma*.

A list of the literature relating to the subject, consisting of 14 titles, is appended.

[Equine piroplasmosis in the Canal Zone] (*Rpt. Dept. Sanit. Isthmian Canal Com., 1913, Mar., p. 43*).—A report of the occurrence of a fatal primary case of piroplasmosis due to *Piroplasma caballi* in a horse in the Ancon corral. The tropical horse tick (*Dermacentor nitens*) was taken from the infected horse and is thought to be the carrier of the disease.

The fourth season's report upon the value of the ventricle stripping operation for roaring, F. HOBDAV (*Vet. Jour., 69 (1913), No. 454, pp. 159-170*).—The author concludes that this operation will in fully 75 per cent of the cases convert a horse required for galloping, such as a hunter, from a useless to a useful animal; where carriage and cart horses are concerned, or animals used for comparatively slow work, the percentage will be fully 90 or even 95.

The frequency of trichinosis in dogs and cats, S. HJORTLUND (*Mannedskr. Dyrleger, 24 (1912), No. 16, pp. 474-483; abs. in Vet. Rec., 25 (1913), No. 1281, p. 453*).—Of 500 dogs and 100 cats from Copenhagen and Frederiksberg examined during the period from January to April, 1912, 2 dogs, or 0.4 per cent, and 2 cats, or 2 per cent, were found to be affected with trichinosis. The conclusions drawn from the investigations reported are as follows:

"All investigations carried out hitherto show that dogs and cats are much more frequently trichinous than are pigs which have been brought up in the same neighborhood. Cats again are more frequently trichinous than dogs. The present researches show that the dogs and cats of Copenhagen are often trichinous; but they also show that trichinosis in dogs and cats is on the decline. This decline is probably due to the inspection of pigs' flesh for trichinosis. It may therefore be expected that if in the future all pigs in Denmark are submitted to compulsory inspection for trichinosis, the disease in dogs and cats will diminish still further. Assuming that dogs and cats are infected exclusively or mainly by the ingestion of trichinous pigs' flesh, it follows that the systematic examination of dogs and cats may be used as a method for observing the effect of the trichinosis inspection of pigs. The bodies of dead dogs and cats, on account of the frequency of trichinosis in them, should always be disposed of in such a way as to insure their harmlessness."

On a hepatic blastomycosis of geese, A. MARTIN and A. DAILLE (*Rev. Vet. [Toulouse], 37 (1912), No. 3, pp. 129-134; abs. in Vet. Rec., 25 (1913), No. 1280, p. 435*).—The parasite found to be the cause of this infection is described as *Cryptococcus anseris*.

Aspergillosis of canaries, D. A. DE JONG (*Centbl. Bakt. [etc.], 1. Abt., Orig.*, 66 (1912), No. 5-6, pp. 390-393; *abs. in Vet. Rec.*, 25 (1913), No. 1281, p. 453).—The chief micro-organisms isolated from sick and dead canaries which came from the breeding establishments of a municipality in the Netherlands were diplococci and *Aspergillus fumigatus*. It was proved by intravenous injections that this *Aspergillus* was the cause of the disease.

RURAL ENGINEERING.

Biennial report of the state engineer of Wyoming, A. J. PARSHALL (*Bien. Rpt. State Engin. Wyo.*, 11 (1911-12), pp. 208, pls. 14).—This notes the comparative development of engineering works in the State since 1900, and includes reports of the board of control, division superintendents, and the state board of examining engineers, and on progress under the Carey Act, the work of the United States Reclamation Service, state highways, and stream gaging. A large amount of stream flow data and a list of original ditch, enlargement, and reservoir permits accompany the report. It is stated that, during the years 1911 and 1912, 2,127 permits were issued providing for the irrigation of 557,254.62 acres of land at an estimated cost of \$12,706,612.84, which is an increase of more than \$10 per acre over the cost for the preceding 2 years.

Water powers of the Cascade Range.—II, Cowlitz, Nisqually, Puyallup, White, Green, and Cedar drainage basins, F. F. HENSHAW and G. L. PARKER (*U. S. Geol. Survey, Water-Supply Paper 313*, pp. 170, pls. 29, figs. 10).—This report is the second of a series dealing with the water powers of streams flowing from the Cascade Range in Washington and Oregon (*E. S. R.*, 24, p. 313). It gives monthly estimates of river discharges from the Cowlitz, Nisqually, Puyallup, White, Green, and Cedar drainage basins and describes the power possibilities of streams with the purpose of indicating in a general way the power resources of each basin and the relative values of the individual power privileges.

Numerous river plans and profiles of the drainage basins accompany the report.

Experience with wood-stave pipe in irrigation, R. K. TIFFANY (*Engin. News*, 69 (1913), No. 6, pp. 244-247, figs. 3).—This article gives the results of extended experiments with wire wound and iron banded wood-stave and bored wood pipe from 4 to 55 in. in diameter, used for irrigation purposes on the Yakima project of the U. S. Reclamation Service.

A considerable portion of the article is devoted to leaks in a 55 in. stave pipe under 190 ft. head and laid beneath a river. Several small leaks in the pipes caused the cutting of the steel bands by the escape of silt bearing water, after which the water pressure broke through the end of the unsupported stave. It is concluded that the one great essential of continuous service from wood-stave pipe not kept filled throughout the year or used in dry soil is a thorough and complete coating of asphalt on the outside, to cover not only the body of the pipe but also all joints, collars, and other fittings. Wooden collars for joints do not give as good results as metallic collars, since it is difficult to secure a tight fit with the wooden collars, and the additional thickness of the shell at this point and the break in the continuity make complete saturation of the joints impossible, causing decay at these points which spreads until a leak develops.

Irrigation, F. H. PETERS ET AL. (*Dept. Int. Canada Ann. Rpt. 1912, pt. 6*, pp. 179-269, pls. 9, figs. 20).—This report includes general irrigation and crop reports from the various irrigation districts by the division engineers, R. J. Burley, W. A. and F. F. Fletcher, and J. C. Milligan; a report of special in-

spections of hydrographic surveys, by P. J. Jennings; and reports on reservoir-site surveys, leveling operations during 1911, the proposed South Saskatchewan diversion canal, and the current meter rating station. Tables of precipitation and temperature data of Alberta and Saskatchewan and current meter rating curves, and data with maps of irrigation districts, accompany this report.

Irrigation (*Porto Rico Sugar Producers' Sta. [Pamphlet], 1912, pp. 25, figs. 3*).—This pamphlet contains the proceedings of a meeting of sugar planters held at Central Fajardo, August 15, 1912. It contains papers on Irrigation (pp. 6–11), Preparation and Cultivation of the Soil with the Purpose of Conserving Moisture (pp. 16–19), and Rainfall at Arecibo (pp. 20, 21), by J. T. Crawley; Irrigation, by E. E. Olding (pp. 23–25); and a discussion on irrigation, by W. W. Schlecht (pp. 12–15).

Land drainage, H. B. WALKER (*Agr. Ed. [Kans. Agr. Col.], 5 (1912), No. 1, pp. 95, pl. 1, figs. 21*).—The author presents in this pamphlet a nontechnical correlation of established drainage principles, collected from the currently recognized drainage literature, together with other information collected by him in his experiments and investigations of the drainage conditions and requirements in the wet sections of Kansas. He discusses in detail surface drainage by open ditches, stream improvement, and channel straightening and underdrainage by tile systems, dealing at length with the action of water in various soils and the required treatment in each case to obtain proper soil moisture regulation.

In conclusion he gives a set of tile-drain specifications with some brief practical suggestions and points to be remembered. Chief of these is that to obtain an economical drainage system a reliable drainage engineer should be employed to make surveys and plans.

Report and plans for reclamation of lands subject to overflow in the Kaskaskia River Valley, Illinois, 1910–11, J. A. HARMAN (*Springfield, Ill.: Rivers and Lake Com., 1912, pp. 70, pls. 39*).—This report contains preliminary plans and cost estimates for the reclamation of lands subject to overflow in the Kaskaskia River Valley from the Shelby-Fayette County line to the mouth of the river in Randolph County. The land area included in this project is approximately 254 sq. miles or 162,560 acres, which is divided into 28 drainage districts.

The work consists chiefly of improvement of the river channel by using 130.1 miles of the old channel and excavating 18 miles of cut-offs, and involves a total of 34,335,200 cu. yds. of fill and excavation for levees and districts. The estimated cost of the entire improvement is \$4,778,610, which, including \$8 per acre for interior drainage by pumping or gravity outlets, averages between \$35 and \$40 per acre. It is estimated that the total benefits to be derived from the reclamation of this land will be from 50 to 100 per cent more than the cost of the improvement.

River bank experimental road (*Engin. Rec., 67 (1913), No. 10, pp. 258, 259, fig. 1*).—An experimental concrete country road 3,000 ft. long and 18 ft. wide was constructed with a crown of $\frac{1}{4}$ in. per foot to determine its applicability to local climatic, traffic, and subgrade conditions in the neighborhood of Sacramento, Cal. Ten sections were constructed containing 8 different mixtures of concrete, varying from 1:2:4 mixture to 1:2 $\frac{1}{2}$:6. Four of the sections were reenforced with light wire mesh of sufficient area to reenforce the slab against temperature and shrinkage stresses. Four types of expansion joints were also experimented with, consisting of oiled surfaces, spaced 10 to 40 ft.; tar paper joints, spaced 10 to 20 ft.; $\frac{1}{4}$ in. joints filled with bitumen, spaced 25 to 40 ft.; and $\frac{3}{8}$ in. joints spaced 30 ft.

Tables of tests are given of the comparative strengths of sand and the properties of concrete mixtures used.

Modern technical building and construction methods, H. GAMANN (*Kulturtechnische Baukunde. Berlin, 1912, vol. 1, pp. XIV+356, figs. 224*).—This is the first volume of this work and contains 4 chapters. Chapter 1, materials of construction, deals with the general testing and strength of the various materials entering into the construction of bridges, buildings, roads, and other structures. Chapter 2, mechanics of construction, deals with those theoretical and empirical parts of the mechanics of engineering which are employed in the design of structures to be built of the above materials. Chapter 3, road construction, deals with the design and construction of roads and pavements, and with the construction machinery used. Chapter 4, sewage disposal, deals with the design and construction of municipal, residential, and village sewage purification and disposal systems.

A large amount of tabulated working data accompanies each chapter.

The manufacture of manila rope, C. W. HUNT (*Sci. Amer. Sup., 74 (1912), No. 1930, pp. 404-407, figs. 14*).—This article describes the manufacture of manila rope and gives the results of extended experiments on its use for the transmission of power and for hoisting.

These indicate in general that the amount of work that this rope will do depends not only on the quality of the fiber and the method of laying up the rope, but also on the kind of weather in which the rope is used, the diameter and material of blocks or sheaves over which it is run, and the stress put upon it. The principal source of destructive wear arises from an excessive load or from defective or unsuitable sheaves. Four-strand rope is said to be more serviceable than three-strand, since it is stronger for the same diameter, and wears more nearly round and smoother.

The breaking strength of manila rope in pounds, based on tests, is given as $7160 \times (\text{diameter, inches})^2$, and the weight per linear foot in pounds as $0.34 \times (\text{diameter, inches})^2$. It is noted that pound for pound manila rope is as strong as steel.

A comparison of leather belts and manila rope for transmitting power indicates that the rope 1 in. in diameter is equal in driving power to a double leather belt $2\frac{5}{8}$ in. wide. Curves and tables of test data are given showing the safe working loads and horsepower of manila rope of various sizes.

Some observations and experiments on the tractive power of horses (*Engin. and Contract., 39 (1918), No. 8, pp. 208, 209*).—The results of experiments by L. E. Conrad, as given before the Kansas Engineering Society, on the tractive power of horse teams on average country earth roads with grades varying from 2 to 9 per cent, indicate that instead of the usually accepted amount of 25 per cent of the weight of the team being equivalent to its tractive power on the level a more nearly correct index is from 35 to 40 per cent of the weight of the team.

The gasoline engine on the farm, X. W. PUTNAM (*New York, 1913, pp. XXXI+527, figs. 179*).—This is a practical and comprehensive treatise on the construction, repair, management, and use of the internal combustion engine as applied to the farmer's work indoors and out and to farm machinery. It considers household, shop, and field uses of the gasoline engine, and includes chapters on engine installation, power transmission, and the best arrangement of the power plant with reference to the work. Because of the simple, non-technical exposition of mechanical principles it is adapted for the use of those without previous mechanical knowledge of the operation and care of gasoline engines, tractors, and auxiliary devices.

Experiments in motor cultivation at Bourges, G. COUPAN (*Bul. Soc. Agr. France, 1913, Feb. 1, pp. 101-108, figs. 4*).—Several steam and internal combustion tractors and motor plows were subjected to a 3-day plowing test. The

results are reported for 9 of the principal machines, including 1 steam engine and 8 internal combustion engines, drawing and operating ground breaking apparatus consisting of moldboard plows, disk plows, and revolving claw plows. The plat of ground on which the tests were conducted consisted of a thin gravelly layer of clay over calcareous rock and presented quite decided undulations.

The rules provided that in the first 2 days the depth to attain should be 15 cm. (6 in.). The results of these tests were fairly satisfactory considering the unfavorable soil conditions, one of the machines effecting extraordinary pulverization, and all the machines dividing the soil well and covering the weeds. The steam tractor presented the greatest fuel economy, but required more labor in attendance.

The 3d-day trials consisted of deep plowing from 25 to 30 cm. (10 to 12 in.), but were on the whole a failure due to the unfavorable soil conditions.

A comparison of these results with results obtained from previous tests under more favorable conditions show that they are on the whole quite concordant.

The status of motor cultivation, O. KASDORF (*Rev. Assoc. Rural Uruguay*, 41 (1912), No. 10, pp. 717-763, figs. 70).—This article deals at length with the problems encountered in motor cultivation in Uruguay, describes several different types of motor plows and their respective effects on soil fertility, and gives the results of tests of the economy and efficiency of both steam and internal combustion motors for plowing, which indicate that both types are applicable to certain conditions.

A hand grain thresher, L. J. BRIGGS (*U. S. Dept. Agr., Bur. Plant Indus. Circ.* 119, pp. 23, 24, fig. 1).—A simple hand thresher is illustrated and described which has proved useful in threshing small quantities of grain. The grain is threshed by passing it between a rotating rubber-covered cylinder and a stationary apron. The novel features include means for adjusting the tension of the apron against the cylinder and a provision for the rapid and easy cleaning of the machine.

Spraying machinery accessories, W. H. GOODWIN (*Ohio Sta. Bul.* 248, pp. 775-804, figs. 38).—This bulletin describes and illustrates mainly the accessories to spraying equipment which the author has found in his experience to be most practical. The accessories are taken up in the order of sequence of their use, beginning with the preparation of the spray material and following it until it is delivered on the trees. This involves a discussion of strainers, suction pipe, air chambers, pressure gages, relief valves, tank fillers, piping and cutoffs, hose and connections, rod cutoffs, spray rods, and nozzles. Several tables are appended giving data in regard to weight, size, shape, and capacity of various commercial types of nozzles and test results in regard to the effective distance and the kind of spray formed by each nozzle.

An all metal poultry cooling rack, M. E. PENNINGTON and H. C. PIERCE (*U. S. Dept. Agr., Bur. Chem. Circ.* 115, pp. 8, figs. 6).—An all metal portable rack for the cooling and grading of poultry, rabbits, game, etc., is described and working drawings and details of the principal parts given.

The construction of dipping tanks for cattle (*Rhodesia Agr. Jour.*, 9 (1911), No. 2, pp. 208-211, pl. 1).—This article gives specifications of the work to be done and the material to be used in the construction of a dipping tank, and includes detailed working plans.

Modern silage methods (*Salem, Ohio, 1913, rev.*, pp. 251, figs. 37).—This work deals with the construction and filling of silos, and gives in addition information regarding the composition and feeding of silage.

Tests of a centrifugal cream separator, R. SANFELICI (*Staz. Sper. Agr. Ital.*, 45 (1912), No. 8, pp. 615-622).—A description of the separator and a discussion of investigations and actual tests are given, including tabulated test results.

The investigations indicate that this machine occupies little space, is easily installed and requires no special foundation, is easily cleaned, is constructed of durable material, has a relatively small first cost, and has a complete assortment of repair parts which may be renewed at little cost. It effects a rigid separation of a large quantity of milk with a relatively small power consumption.

The use of fuel in creameries, VON MERKATZ (*Milchw. Zentbl.*, 41 (1912), No. 23, pp. 723-727).—For the purpose of comparing the economy and efficiency in fuel consumption in dairies of different milk-handling capacity, tabulated data are given from 2 years' operation of 108 creameries, varying in capacity from 500,000 to 8,500,000 kg. of milk per year. The data show wherein the application of up-to-date and scientific methods of management tend to promote economy in fuel consumption.

Ice cold storage on the farm, R. R. GRAHAM (*Ontario Dept. Agr. Bul.* 207, 1912, pp. 48, figs. 29).—A general discussion of the value of cold storage on the farm, the properties and cooling power of ice, and the essentials of a good ice house is followed by several designs with plans and bills of material of make-shift and permanent ice houses, and combinations of ice houses and cold storage systems.

The basis of the designs is that cold storage involves means of controlling not only the temperature but the humidity, purity, and circulation of the air within the storage rooms and that a successful ice house should have a shady and convenient site, adequate drainage, free air circulation over the ice, good insulation, and sufficient banking to prevent warm air gaining access from beneath. Sawdust is considered the most efficient insulating material, although hay or straw may be successfully used. It is suggested that at least 1 ft. of insulating material be packed between the ice and the side walls, 2 ft. of insulating material under the ice, and a considerable quantity on top.

In addition suggestions are given on the use of refrigerators, the proper storage of perishable products, and the proper harvesting of the ice crop.

A bulletin dealing with mechanical cold storage is in preparation.

Lightning protection of buildings, E. J. BERG (*Engin. News*, 69 (1913), No. 6, pp. 240-242, figs. 2).—The author gives the results of his own and other investigations of the action of lightning and of the efficiency and protective value of lightning rods, and outlines methods of designing and erecting lightning rods to give the maximum of protection.

The sanitary privy (N. C. Bd. Health Spec. Bul. 13, 1912, pp. 15, figs. 3).—This bulletin points out the hygienic and sanitary value of the sanitary privy and gives detailed directions for its construction and care, accompanied by complete working plans and a bill of materials of a design considered to be cheap and efficient. It is stated that the two essentials of sanitary privy construction are that they shall be fly-proof and water-tight. A set of proposed sanitary ordinances is also given.

RURAL ECONOMICS.

Agriculture, 1909 and 1910.—VI, Reports by States, with statistics for counties (Alabama-Montana) (Thirteenth Census U. S., 6 (1910), pp. 977, figs. 45).—This volume constitutes a separate report of the Thirteenth Census on agriculture, covering 25 States in alphabetical order from Alabama to Montana,

together with a report on irrigation for those States in which irrigation statistics were collected. The information relates to farms and farm property; number, acreage, and value of farms classified by tenure, mortgage debt, color, and nativity of farmers; live stock products and domestic animals sold or slaughtered on farms; value of all crops and principal classes thereof, and acreage and production of principal crops; and selected farm expenses and receipts; all by States and counties. Data are also given showing farms and acreage irrigated; irrigation works; cost of construction, operation, and maintenance; crops irrigated—acreage, production, and value; and acreage irrigated and irrigation enterprises by counties, 1909–10.

The agricultural census of France, A. DE FONTGALLAND (*Bol. Agr. Téc. y Econ.*, 5 (1913), No. 51, pp. 265–271).—Notes and tables showing the condition of various agricultural activities in France for varying periods are here presented.

Attention is directed to the large percentage of the landed area in small farms, the number of farms of less than 1 hectare (2.47 acres) being reported as 2,087,851, number of farms containing from 1 to 10 hectares 2,523,713, from 10 to 40 hectares 745,862, from 40 to 100 hectares 118,497, and more than 100 hectares 29,541. The number of persons engaged in agriculture and forestry in 1909 was 8,777,053, of whom about 5,452,300 were males.

Tables are given showing the acreage and production of leading crops from 1890–1909.

Farm management in German agriculture, B. SAGAWÉ, R. TUCKERMANN, and F. WATERSTADT (*Arb. Deut. Landw. Gesell.*, 1913, No. 214, pp. 114+89+51+26+81+105+3+17+9+143, tables 3, pl. 1).—Notes and tables are here presented showing the relation of credits, labor, markets, prices, and transportation facilities to agricultural activities in the Province of Silesia.

The profitableness of the root crop production, B. SAGAWÉ (*Fühling's Landw. Ztg.*, 62 (1913), No. 4, pp. 113–128).—Notes and tables showing the profitableness of farm management with reference to size of farm, type of farming, and method of farming (extensive, average, or intensive) are here presented. Concrete illustrations are given showing the cost of the various factors entering into the production of root crops and the relation each bears to the total cost and net income.

The advantages and disadvantages of farm machinery in farm operations, A. SCHNIDER (*Landw. Hefte*, 1913, No. 11, pp. 47).—Notes and data are here presented showing at length the economic significance of the use of farm machinery with reference to types of farming, size of farms, kind, amount, and cost of labor available, and other factors entering into farm production.

The agricultural activities of the Jews in America, L. G. ROBINSON (*New York*, 1912, pp. 96).—This is a brief survey of the circumstances and conditions which led to the formation of Jewish agricultural organizations in various countries, describing in more or less detail the results of the work as found in the United States and Palestine. Some failures are noted, but they are attributed to conditions or individual circumstances, rather than to inherent lack of Jewish adaptability to agriculture. The author predicts that the spirit of organization which is now being crystallized into agricultural cooperative organizations in the United States will appeal particularly to the Jewish farmer and mean much toward the development of Jewish agriculture.

Cooperation in agriculture, G. H. POWELL (*New York*, 1913, pp. XV+327, pls. 16).—This volume is intended as a discussion of the principles that underlie the organization and management of agricultural cooperative associations in the United States, and the application of the methods to the production, handling, distribution, and sale of farm crops, and other agricultural activities. The

author points out the need of legislation in most of the States that will permit the formation and protection of nonprofit cooperative associations, and discusses some of the legal questions involved in the formation, financing, and management of such organizations. Illustrations are given showing how the principles of cooperation are applied to certain agricultural crops, such as animal and plant improvement, the handling of grain and dairy products, cotton, the distribution and sale of crops, and the cooperative purchase of supplies. The application of the cooperative method to rural credit, irrigation, the telephone, and insurance is also briefly discussed. A lengthy bibliography is appended.

Farm credits, J. R. Dos Passos (*U. S. Senate, 62. Cong., 3. Sess., Doc. 1001, 1913, pp. 8*).—This document discusses briefly the Credit Foncier system as operated in European countries, and recommends that such a system be established in the United States under a similar plan; that is, Congress would by special act provide for the incorporation of a loan and mortgage company, the incorporators being named in the act to represent each State. The authorized capital stock suggested is \$200,000,000, to be subscribed for by the public, and the company being allowed to begin business when \$30,000,000 is subscribed and paid in. One-fourth of the existing capital would be held as a special reserve, and the remainder used in commercial and other financial operations and in loaning money on imperishable products to farmers. A central office would be located at Washington, D. C., and branches established in the capital of every State and subagencies in other principal cities. The primary object would be to give to farmers and other borrowers the same facilities for borrowing money at a low rate of interest as are now enjoyed by other business enterprises located in money centers. The plan as outlined involves government supervision.

The details of the plan are fully described.

[**A land bank for South Africa**] (*Agr. Jour. Union So. Africa, 4 (1912), No. 6, pp. 808-810, fig. 1*).—The nature and scope of the operations of the Transvaal Land Bank are briefly described, and the establishment of a union bank is noted.

The purpose of these banks is to aid deserving farmers in financing and developing their farms. The Transvaal bank has within the last 5 years furnished loans to 5,661 persons to the amount of £2,105,000, the security being farm property worth over £6,000,000. It is noted that the bank has not only enabled farmers to pay off mortgages by advancing money to them at reasonable rates, but it has brought down the general rate of interest on farm property.

Ninety million dollars loaned by State to farmers, W. M. DUFFUS (*Co-operative Farmer, 5 (1913), No. 7, p. 3*).—This article presents the results obtained from a special inquiry as to the history of State loans to farmers in Australasia and 8 States in the United States.

It is shown that more than \$90,000,000 have been loaned by the New Zealand and Australian governments to their farmers. The essentials ascribed by the author for successfully operating such a system of loans to farmers are summarized as follows: (1) It should be self-sustaining. (2) Loans should be made only for special purposes, such as the purchase of land, paying off mortgage debts, and making necessary improvements on the farm. (3) Loans should be limited in amount to one-half, three-fifths, or two-thirds of the market value of the land, exclusive of buildings. (4) Repayment should be on the amortization plan. (5) The aggregate amount of loans to any individual should be limited, preference being given to applications for loans of small amounts. (6) The loans should run for 20, 30, or 40 years, the borrower having the privilege to repay them at any time. (7) The funds should be obtained by the sale of State bonds and the interest charged the borrower should be just high enough to pay the interest on the bonds, the cost of administering the system, and the

creating of a reserve sufficient to cover probable losses. These essentials are said to exist in the system as operated by the New Zealand Government.

A plan for the organization of a rural banking system in the State of Virginia, C. H. DAVIS (*U. S. Senate, 62. Cong., 3. Sess., Doc. 1006, 1913, pp. 32*).—The author outlines in this document what he considers a practical plan for the organization of a rural banking system in the State of Virginia. Among other things the plan provides for the organization of local rural banks which will serve to bring together the neighborhood funds and make them available for the development and improvement of farms in the surrounding community; loans would be made to farmers for periods not exceeding fifty years, secured by first mortgage, based on the appraisement by the local bank, limited to a certain proportion of the value at which the lands are assessed for state taxation, and to be annually reduced by the repayment of a small portion of the principal. They would bear a low rate of interest, to be guaranteed both as to principal and interest by the local rural bank and by a large central bank, such bank to market the loans so secured and guaranteed.

Further details of the plan are given.

How a system of farm credits will benefit the farmer, T. J. JACKSON (*[Fargo, N. Dak.], 1913, pp. 14*).—This is an address delivered at the Grain Grower's Convention held at Fargo, N. Dak., January 14–18, 1913, in which the author presents a brief historical sketch of our banking system, points out the defects, gives a brief history of the cooperative movement, discusses the European credit systems, and proposes the establishment of agricultural credit banks in the United States for the purpose of supplying farmers with money at low rates of interest with which to buy land and finance their farms.

AGRICULTURAL EDUCATION.

The rural school as a center of country life, C. W. DABNEY (*Proc. Conf. Ed. South, 15 (1912), pp. 142–152*).—The thought brought out in this address from an agricultural standpoint is that when the teachers in the rural schools can cooperate with parents in arranging field and feeding demonstrations, testing milk and seeds, studying varieties of plants, etc., the work of the school will then help to make the activities of the farm intelligent and thereby induce boys to stay on the farm, prepare people for a larger and more effective country life, and adapt the rural school more closely to its needs.

The rural school of to-day and ten years hence, C. H. LANE (*Md. State Teachers' Assoc. Ann. Meeting, 45 (1912), pp. 134–137*).—Some of the most glaring defects of the rural schools are pointed out as a basis for considering what the country schools should be 10 years hence.

[Rural school improvement] (*Ohio Teacher, 33 (1913), No. 7, pp. 289–328, figs. 9*).—This number is devoted almost wholly to the papers and addresses presented at the eleventh annual session of the Ohio School Improvement Federation. Among the papers given are Our Rural Schools, State Support of Public Schools in Ohio, What Professional Training Should the State Require of Inexperienced Teachers, and The Centralization of Rural Schools.

The teaching of agriculture in the public schools of Illinois, I. A. MADDEN (*Normal School Quart. [Normal, Ill.], 1913, No. 46, pp. 16*).—A general discussion of the subject, together with a bimonthly outline for a high school course in agriculture covering 4 years.

Winnebago County schools annual reports, O. J. KERN (*Ann. Rpt. Winnebago Co. [Ill.] Schools, 1912, pp. 96, figs. 98*).—This report contains, in addition to the usual information concerning the schools of the county, chapters on outdoor improvement, including education for country life, indoor improvement with reference to health conditions, schoolroom decoration, school libra-

ries, etc., playgrounds, agricultural education, consolidation of county schools, and nature-study agriculture in country life education. This last chapter deals particularly with school and home gardens, and a 10 years' summary of the Winnebago County Farmer Boys' Experiment Club.

Special report on agriculture and domestic science made by the state board of regents (*Charleston, W. Va.: Dept. of Schools, 1912, pp. 75, pls. 2, figs. 19*).—This report, made November 21, 1912, contains a full discussion of the agricultural conditions and possibilities of West Virginia, means of improving agriculture and rural life, and equipment needed for the university and secondary and elementary schools, together with some results of special efforts in other countries and States along agricultural lines.

The teaching of agriculture in the rural schools of Texas, C. H. WINKLER (*Bul. Univ. Texas, 1912, No. 251, pp. 41-45*).—Some of the obstacles that now prevent efficient teaching of agriculture in the public schools are briefly discussed, and suggestions given on how agriculture may be included in an overcrowded schedule.

Agricultural education (*Proc. Agr. Soc. Trinidad and Tobago, 13 [1913], No. 2, pp. 51-61*).—This gives the report of an agricultural education committee, appointed by the governor, on the present status and requirements of agricultural education in Trinidad, and the report of a select committee of the Agricultural Society of Trinidad and Tobago on the preceding report, making further recommendations.

Agricultural instruction under the supervision of the chamber of agriculture (*Jahresber. Landw. Kummer Prov. Posen, 1910, pp. 104-114*).—A report on the agricultural winter schools, special and agricultural schools, rural continuation courses, agricultural instruction in the army, and itinerant instruction for 1909-10, under the supervision of the Chamber of Agriculture of the Province of Posen.

Practical training of farm managers, E. LANGENBECK (*Mitt. Deut. Landw. Gesell., 28 (1913), No. 2, pp. 24-26*).—A discussion of the practical training of farmers' sons either by changing from one farm to another or through the farm school. The plan of practical training given in connection with the agricultural winter schools in Norway is described.

Agricultural home economics instruction for women, Mrs. O. BUSSARD (*Vie Agr. et Rurale, 1911, No. 2, pp. 40-43, figs. 5*).—The author describes the following phases of home economics instruction in Belgium: (1) Itinerant schools, (2) home economics sections in connection with secondary schools, (3) agricultural home economics schools or professional institutes, and (4) an agricultural high school for girls at Heverle.

Project for the organization of professional agricultural instruction in France (*Bul. Mens. Off. Renseig. Agr. [Paris], 11 (1912), No. 12, pp. 1648-1667*).—This is an outline of a project, together with detailed information, for the reorganization of the system of agricultural instruction in France as presented to the Chamber of Deputies by the ministers of agriculture, public instruction, and finance.

Course of study in industrial education including domestic science, manual training, and agriculture for the schools of New Mexico, MANETTE A. MYERS ([*Santa Fe*]: *State Dept. Ed., 1913, pp. 51*).—This course is in compliance with the New Mexico laws of 1912 which empower the state board of education to prescribe and adopt a course of study for industrial education, including agriculture, manual training, and home economics, and covers the first eight grades.

A one-year course in secondary agriculture, G. A. BRICKER (*Ohio Teacher, 32 (1911), No. 1, pp. 13*).—This course has been prepared for the township

and village high schools of Ohio. Plant and animal studies are arranged from September to January, machinery and general farm management studies during December and January, soil studies during February and March, and studies in conditions of plant growth during April and May.

An outline of a year's work in beginning agriculture, W. F. COPELAND (*Ohio Teacher*, 32 (1911), No. 1, p. 12).—The work is outlined by months—September to April—and includes the subject matter to be taught each month, together with laboratory, field, observation and report, and home study work.

Laboratory manual for elementary agriculture, J. M. WILSON (*In Elementary Course of Study and Manual for County Institutes*, June, 1913–14. Little Rock, Ark.: State Dept. Ed. [1913], pp. 250–267).—The exercises in this outline are to be used in connection with some text-book in agriculture and cover in an elementary way such subjects as soils, plant production, live stock and dairying, insects, and plant diseases.

The agricultural booklet, C. H. LANE (*Bul. Univ. Texas*, 1912, No. 251, pp. 26–33).—Full directions are given for making a booklet on cotton adapted to the fifth and sixth grades of the elementary school.

Dairy laboratory guide, G. L. MARTIN (*St. Paul, Minn.*, 1913, pp. 140, figs. 17).—This laboratory guide is designed to give the beginner in the study of dairying a few suggestions as to the production and care of milk, and the testing, manufacturing, and marketing of dairy products. The object of each exercise, the apparatus needed, steps taken in performing the exercise, and problems involving a practical application, are set forth.

Exhibits of grains, grasses, and legumes for farm and school use, A. C. ARMY (*Minnesota Sta. Press Bul.* 42, pp. 4, figs. 3).—The 7 sets with which this series of exhibits on farm crops deals are wheat, barley, millet, miscellaneous grains, seeds of common farm crops, grasses, and legumes. It is announced that if there is sufficient demand for these sets so that they can be made in large numbers, the University of Minnesota will sell them at cost, estimated at 75 cts. each.

Classified bibliography of home economics books and pamphlets for study and reference work, LAURA COMSTOCK and CORNELIA PALMER (*Timely Helps for Farmers* [*Col. Agr. Univ. Me.*], 6 (1913), No. 6, pp. 33–44).

A simple method of cataloguing agricultural pamphlets suitable for the school or home library, C. H. LANE (*Bul. Univ. Texas*, 1912, No. 251, pp. 18–22).—This description of cataloguing agricultural publications has been prepared in the hope of helping teachers of agriculture to appreciate and use the wide range of useful information embodied therein, but often unused and unusable.

Boys' and girls' clubs, O. B. MARTIN (*Tenn. Agr.*, 1 (1912), No. 4, pp. 173–183).—An address given before the East Tennessee Farmers' Convention and Institute, May, 1912. The object of the boys' and girls' demonstration work and its influence upon the farmers and upon the boys and girls, educationally and otherwise, are discussed in full.

Agricultural contests (*Cornell Rural School Leaflet*, 6 (1913), No. 4, pp. 224–318, figs. 31).—The purpose of this bulletin is to help in organizing agricultural contests for boys and girls. The contests are arranged in 3 groups, (1) for boys and girls under 16 years of age, (2) for boys from 16 to 21 years of age, and (3) for girls only. In the first group the contests include growing for prizes ears of corn, a peck of potatoes, and small lots of vegetables, flowers, and apples. The second group includes contests with an acre of corn, oats, or clover, a half acre of potatoes, or plats of vegetables or strawberries, occupying 50 by 100 ft. of ground.

The third group deals with bread making, canning, and sewing. An outline record of the work, cultural directions, instructions to judges, and rules for contestants accompany each contest.

Bean growing contest, F. L. GRIFFIN (*California Sta. Circ. 93*, pp. 8).—This circular outlines the nature of the boys' and girls' bean growing contest, and gives general directions for growing beans and a suggested score card.

Suggestions regarding the teaching of vegetable gardening, J. W. LLOYD (*Proc. Soc. Hort. Sci.*, 1912, pp. 93-96).—According to this paper, there are at least six generally recognized means of instruction available in the teaching of vegetable gardening: (1) Textbook work, (2) assigned reference readings, (3) practical exercises, (4) lectures, (5) laboratory work, and (6) examination of the literature. In an elementary course preference is expressed for using almost exclusively the first 3 of these, with predominance given to the textbook work, and with practical exercises as an important, though secondary, feature, and reference readings employed only occasionally as a means of supplementing the text. A garden of at least 20 by 40 ft. in area should be assigned to each student. If the class is large the students' gardens should be exactly alike as to the assortment and arrangement of vegetables.

In a course in market gardening, practical garden work under competent supervision should be the predominating feature. This should be supplemented by assigned reference readings and occasional lectures, especially on the distinctly commercial aspects of the subject. "For the practical instruction in market gardening the ideal plan would be to have sufficient land and equipment to operate a vegetable garden on a commercial basis, having the students do as much of the work as possible."

An advanced course in special phases of problems of vegetable gardening should be quite flexible and should consist of laboratory and field experiments as contrasted with practical garden exercises, and of research into the literature of a given subject rather than the reading of assigned references. Personal conferences with individual students at regular intervals are desirable. For advanced work on special problems greenhouse space is essential.

"Laboratory equipment of a botanical nature is necessary for many phases of the work. Chemical apparatus and supplies might also be needed. Sufficient land should be available for conducting field tests."

The demonstration orchard as a factor in horticultural education, R. W. REES (*Proc. Soc. Hort. Sci.*, 1912, pp. 75-80).—Two types of demonstration orchards used by the Massachusetts Agricultural College in its extension work are described.

In the establishment of new orchards, a 15-year contract is signed between the college and the owner of the land. The latter furnishes, free of cost or rent, 4 acres of land selected by the college, performs all labor according to directions, and supplies the fertilizers, spraying materials, etc. He keeps a record of the expense incident to the production and marketing of the crops and the value of the fruit and produce sold or used on the place.

The work is usually initiated by holding a horticultural institute in the community where it is desired to establish an orchard. Applications for the orchard are received at the time and the most desirable location selected.

The demonstration orchard is made an educational center for the locality. Mailing lists are kept of all within reach of the orchard interested in horticultural subjects, and utilized to give notice of demonstrations or visits.

"The renovation orchards are handled on a 5-years' contract, the college taking general supervision of fertilizing, pruning, spraying, and cultivating; the owner buying the materials needed, and furnishing the labor. As a com-

munity educational factor they have been handled similarly to the new demonstration orchards, and with equally good results."

Successful vacant lot gardens, J. H. DIX (*Ann. Rpt. Phila. Vacant Lots Cult. Assoc.*, 16 (1912), pp. 16, figs. 5).—In this report of the Philadelphia Vacant Lots Cultivation Association the author states that the land is loaned free of charge. The association spends about \$5 per garden for plowing, fertilizer, seeds, etc., and charges \$1 per family the first season, \$2 the second, and so on, until the fifth season, when about the full cost is collected. The families spread the fertilizer and plant, cultivate, and harvest the crops, supplying their family needs and selling any surplus. In 1912, 442 families were assigned gardens, averaging about one-sixth of an acre. This was an increase of about 30 per cent over the previous season, and several hundred more gardens could have been assigned had the association had the means.

Vacant lot gardening in Minneapolis, L. J. BOUGHNER (*Ann. Rpt. Hort. Soc. Ontario*, 7 (1912), pp. 33-37).—This comprises a record of the second year's work in civic vacant lot gardening conducted under the direction of the Garden Club of Minneapolis.

Neighborhood improvement clubs, E. L. HOLTON (*Agr. Ed. [Kans. Agr. Col.]*, 5 (1912), No. 11, pp. 14).—This pamphlet is intended for the rural, village, and town communities of Kansas. It contains among other things a suggestive constitution, methods of work including surveys on health, economic, social and moral, and educational conditions, topics for discussion, and a small list of books which may be used as a working library for a neighborhood improvement club.

Illinois farmers' institute: Department of household science (*Ill. Farmers' Inst., Dept. Household Sci. Yearbook 1912*, pp. 252, figs. 21).—This is an account of the proceedings, addresses, field reports, etc., of the thirteenth annual meeting of the department of household science of the Illinois Farmers' Institute held February 20-22, 1912.

MISCELLANEOUS.

Thirty-fifth Annual Report of North Carolina Station, 1912 (*North Carolina Sta. Rpt. 1912*, pp. 149+89-145+132+30, figs. 107).—This contains the organization list, a report of the director and heads of departments, the experimental work of which is for the most part abstracted elsewhere in this issue, a financial statement for the fiscal year ended June 30, 1912, numerous special articles abstracted elsewhere in this issue, and reprints of Technical Bulletin 8 and Bulletins 217 to 223, previously noted.

[First Report of the Porto Rico Sugar Growers' Association Station, 1911] (*Porto Rico Sugar Growers' Sta. Bul. 1*, pp. 31+18).—This contains the organization list, a report by the director on the establishment and work of the station from August 10, 1910, to May 1, 1911, a report of a preliminary survey of sugarcane cultivation in Porto Rico, and reports of the entomologist and pathologist previously noted (*E. S. R.*, 26, pp. 59, 143).

Second Annual Report of Porto Rico Sugar Producers' Station, 1912 (*Porto Rico Sugar Producers' Sta. Rpt. 1912*, pp. 35).—This contains the organization list and reports of the director and heads of departments. The experimental work reported is for the most part abstracted elsewhere in this issue.

NOTES.

California University and Station.—The appropriations of the last legislature to the university aggregate \$3,856,978 for the ensuing biennium. Of this amount \$700,000 is for the maintenance of the agricultural work, in addition to \$135,000 for new buildings at Davis, \$60,000 for the purchase of 200 acres of land for the Southern California substation, \$100,000 for a laboratory building, and \$25,000 for a residence and barns at the substation.

W. T. Clarke has been appointed professor of agricultural extension and superintendent of farmers' institutes, and T. Francis Hunt assistant superintendent of farmers' institutes. Other promotions and appointments are as follows: As professors, E. B. Babcock in genetics, F. T. Bioletti in viticulture and entomology, J. S. Burd in agricultural chemistry, C. B. Lipman in bacteriology, and C. M. Haring in veterinary science; Miss E. H. Smith as plant pathologist; David N. Morgan as assistant to the director of the station; as assistant professors, B. H. Crocheron, of the Baltimore County Agricultural High School, of Maryland, in agricultural extension, D. B. Pratt in pomology, Walter Jennings Taylor, F. M. Hayes, and C. M. Roadhouse in veterinary science, W. V. Cruess in zymology, F. L. Griffin in agricultural education, C. H. McCharles in nutrition, and B. A. Madson in agronomy; as instructors, G. A. Coleman in entomology, George P. Gray in insecticides (and chemist in the insecticide laboratory), J. F. Mitchell in veterinary science, S. S. Rogers in plant pathology, Miss M. E. Stover in nutrition, C. J. Wight in botany, F. H. Wilson in soil technology, E. C. Van Dyke in entomology, Ira J. Condit in citriculture, and L. J. Nickels in insect industries; and as assistants, R. E. Campbell in entomology, Miss Lillian D. Clarke in agricultural extension, Wilson Gee in genetics, O. W. Iraelson in irrigation, W. F. Oglesby in viticulture, Miss C. J. Hill in dairy testing, and Miss Katherine D. Jones in landscape gardening. A. B. Shaw has resigned as assistant in entomology.

Colorado College and Station.—Dr. E. P. Sandsten, horticulturist of the Alabama College and Station, has been appointed head of the department of horticulture, beginning August 1. G. P. Weldon has resigned as instructor in zoology and entomology and assistant entomologist, to accept a position with the California Commission of Horticulture.

Connecticut College.—The new poultry husbandry building is nearing completion. This is a two-story structure with basement, subbasement, and attic, and is 60 feet long by 40 feet wide. It will cost \$25,000, which is believed to be one of the largest single appropriations ever made for instruction, investigation, and extension work in poultry husbandry.

The main floor is devoted to offices, class rooms, and the library, and the second to a lecture room seating 200, a research laboratory, and quarters for an educational exhibit. The attic contains photographic facilities and rooms for attendants.

The basement and subbasement, both of which owing to the peculiar topography of the site selected may be reached from the ground level at the rear, contain most of the special poultry equipment, including incubator rooms, a killing room, cold storage room, etc.

Hawaii Sugar Planters' Station.—C. F. Eckart has resigned as director to engage in commercial work and is succeeded by H. P. Agee, who for the past two years has been the station agriculturist.

Idaho University and Station.—J. S. Jones, professor of agricultural chemistry and chemist, has been granted a year's leave of absence to accept a fellowship in the college of agriculture at Cornell University.

Illinois University.—Data recently compiled show that of 506 former students who replied to inquiries about their present occupations, 502 are either farming, teaching, or following some other work associated with agriculture. The farmers number 349, teachers and investigators 104, and veterinary surgeons and others in work related to agriculture 49, while only 1 per cent have drifted into work unrelated to the farm.

Work has begun on the new stock judging pavilion.

Iowa College and Station.—A total of 302 degrees were conferred at the recent commencement, of which 177 were in the division of agriculture. The total enrollment of students in that division, exclusive of short courses, reached nearly 1,400 during the year, an increase of over 100 per cent in three years.

E. N. Wentworth has resigned as associate professor of animal husbandry to accept an appointment with the *Breeder's Gazette*, vice E. T. Robbins, who becomes farm adviser of Tazewell County, Ill. W. H. Stevenson, chief in agronomy, has also been appointed vice director of the station.

Kansas College and Station.—The extension department is offering a correspondence course in concrete construction.

Breeder's Gazette announces that Dr. J. B. Gingery, assistant in veterinary medicine, has resigned to become assistant professor of veterinary medicine in the college of agriculture, University of Missouri.

Kentucky Station.—The new addition to the station building was dedicated June 3. The principal address was made by Dean Davenport of the Illinois University and Station. The exercises were in part commemorative of the life and work of former Director Scovell, a portrait of whom was presented to the university upon the occasion.

Missouri University.—Farm advisers under a cooperative agreement between the county concerned, the college of agriculture, and this Department, have now been selected for eight counties as follows: Cape Girardeau, C. M. McWilliams; Buchanan, F. W. Faurot; Johnson, C. M. Long; Audrain, E. W. Rusk; Dade, E. H. Rödekohr; Pettis, S. M. Jordan; Jackson, E. A. Ikenberry; and Marion, H. H. Laude.

Montana College and Station.—Alfred Atkinson has resigned as professor of agronomy and agronomist to engage in commercial work.

Nebraska University and Station.—The new plant industry building was dedicated June 10, the address being delivered by Dr. John M. Coulter, of the University of Chicago, upon the subject of Practical Science. In connection with the exercises the honorary degree of doctor of agriculture was conferred upon Dean A. F. Woods of the University of Minnesota, and Dean H. J. Webber of the University of California.

The agricultural high school at Curtis, which is under the supervision of the university, is opening in September a four-year agricultural school of secondary grade. C. V. Williams has been appointed superintendent, Ellis Rail, now assistant animal husbandman in the university and station, as professor of agriculture, and E. R. Gross as professor of manual training and farm mechanics. The equipment includes a farm of 450 acres of land.

George C. White, adjunct professor of dairy husbandry, has been appointed assistant in dairying in the station.

New Hampshire College.—A four-year course in home economics is to be offered, beginning with the next college year.

Rutgers College.—An industrial fellowship in plant pathology for the study of the diseases of the potato has been established.

Cornell University.—The legislature has granted \$334,000 to the college of agriculture for the construction of buildings. This will provide for the completion of the auditorium, forestry building, animal husbandry building, heating plant, additional small buildings for the poultry department, and the erection of barns for hogs and sheep, a hothouse, and a new rural schoolhouse.

About 200 acres of open land above a proposed university reservoir at Varna has been put in charge of the forestry department for experimental and demonstration plantations. Over 50 acres were planted in 1912 and 1913, chiefly to white pine.

A summer school for leadership in country life, with a three-year graded course as a part of its regular work, has been established. The purpose of the school as announced is to provide a course of training for all classes of rural leaders, such as rural ministers, secretaries of young men's and young women's christian associations, officers of men's brotherhoods and other religious organizations, boy scout masters, school superintendents, principals, and teachers, editors, officers of granges, institute lecturers, and other persons who occupy positions of leadership and influence in the open country.

K. C. Livermore, M. W. Harper, E. S. Savage, E. S. Guthrie, and C. R. Crosby have been advanced to full professorships. L. S. Tenny has been appointed professor of rural development and state leader in farm demonstration work, beginning October 1. H. H. Whetzel has been granted a year's leave of absence, which will be spent largely in graduate work at the University of Heidelberg. Royal J. Haskell has been appointed assistant in plant pathology.

Ohio State University and Station.—Plans are practically completed for the new horticultural and forestry building at the university. This is to be a two-story and basement structure, 250 by 82 feet. It will be divided vertically between the departments of horticulture and forestry, and will contain in addition to laboratories, class rooms, offices, etc., a cold storage room, spray room, and an auditorium seating 500 persons.

The biology building is already under construction. This is also a two-story and basement structure of red pressed brick, and will house the departments of zoology and botany. The special features include an aquarium and a biological museum, and greenhouses and an insectary are to adjoin it. A botanical garden and arboretum are to be laid out nearby.

The state appropriations to the station for 1913 aggregate \$229,200. Of this amount \$40,000 is for administration, \$18,500 for agronomy, \$20,000 for animal husbandry, \$10,000 for botany, \$5,000 for chemistry, \$37,500 for cooperative work, \$10,000 for dairy husbandry, \$8,000 for entomology, \$12,000 for forestry, \$20,000 for horticulture, \$8,000 for nutrition, \$20,000 for soils, and \$20,200 for additional buildings and equipment.

Oregon Station.—The state pure seed law was revised by the last legislature, and an annual appropriation of \$1,000 made to the station for the maintenance of a seed testing laboratory.

Clemson College and Station.—W. D. Evans, one of the state-elected members of the board of trustees, died April 10.

Tennessee University and Station.—The fortieth annual meeting of the East Tennessee Farmers' Convention was held on the station farm May 20 to 22, with an attendance of about 2,000. Dean H. A. Morgan is in Europe with the

commission of the Southern Commercial Congress which is studying rural credit systems.

Utah College.—At the last session of the legislature, George T. Odell, of Salt Lake City, and Joseph Quinney, jr., of Logan, were appointed to the board of trustees, vice Mathonihah Thomas and Dr. J. A. Widtsoe.

Washington Station.—Dr. Ira D. Cardiff, head of the division of plant pathology and physiology, has been appointed director.

Wisconsin University.—A party of about 50 public officials and other citizens of Philadelphia and other Pennsylvania cities visited the university May 21 to 25, paying particular attention to its relations to the State, cities, and rural communities through its extension work. The activities of the college of agriculture in this direction were objects of special interest. The ultimate purpose of the trip was announced as the development of similar relationships in Pennsylvania, in connection with the University of Pennsylvania and the Pennsylvania State College.

Cereal Field Station in California.—The cereal station at Biggs, Cal., (E. S. R., 28, p. 98) has been operated since June, 1912, by the Bureau of Plant Industry of this Department, as a field station in connection with its cereal investigations. About 50 acres of land and \$5,000 for buildings was furnished by the Sacramento Valley Grain Growers' Association, which established the station. The land is being partly dry farmed and partly under irrigation, the irrigated portion being devoted largely to experiments with rice.

New York State Advisory Board on Agricultural Education and Country Life Advancement.—This board was authorized by the New York Legislature of 1911, and is composed of 12 persons, viz, the commissioner of education, commissioner of agriculture, director of the New York State College of Agriculture, director of the New York State Station, director or dean of the state schools of agriculture at Alfred, Canton, and Morrisville, a member of the State Fair Commission, and the remaining members appointed by the governor. The board reports annually to the governor its views and recommendations upon agricultural education and the advancement of interest in country life. The members of the board receive no compensation, but \$1,000 was appropriated for the fiscal year beginning October 1, 1912, for other expenses.

State Aid for High Schools in Nebraska.—The new school laws, enacted by the last legislature of Nebraska, provide that any high school accredited to the state university and fitted to give training in agriculture, manual training, and home economics, may receive state aid not exceeding \$1,250 a year. The school must maintain at least two years of high school work in these subjects, employ at least two teachers, and provide an approved course in normal training for preparing teachers for rural schools.

Any rural school district which gives instruction in agriculture, manual training, and home economics in accordance with rules and regulations of the state superintendent of public instruction, and becomes associated with an accredited high school may receive as state aid \$50 a year.

Agriculture in the Common Schools of Ohio.—It is stated in the *National Stockman and Farmer*, by one of the agricultural supervisors of Ohio, that after a year and a half of the Cahill Law requiring agriculture to be taught in the common schools of that State, more than 900 high schools are teaching agriculture, and more than a half million boys and girls are studying the subject in the public schools. It is estimated that about 4,000 teachers took work in agriculture at the summer schools last session.

Agriculture in Secondary Schools in Manitoba.—The Manitoba Provincial Department of Education is endeavoring to introduce agricultural teaching into the secondary schools of the Province. As a result of its efforts, two townships

have agreed to appoint an agricultural instructor, and the Stonewall High School began instruction last year. The government is to pay one-half the salaries and otherwise assist in making the course successful. Regular short courses are to be scheduled from November 1 to April 1, covering work as nearly as possible in line with work done in the first two years of an agricultural college course. Experimental or demonstration work will also be carried on by students on their own farms under the supervision of the instructor.

Progress in Agricultural Education in Brazil.—A large number of candidates have this year presented themselves for matriculation at the agricultural colleges and apprentice schools. The intermediate or theoretical-practical school at Bahia, with which an apprentice school is connected, now has an attendance of 56 pupils, and a similar school attached to the federal stud farm at Pinheiro has been opened with an enrollment of 35 students for the first year's course.

Additional apprentice schools have been established at Tubarao, on ground given by the State of Santa Catharina; at Satuba, in the former agronomic station and stud farm at Santa Luzia de Norte, given by the State of Alagoas; at Igarape, on the former Augusto Montenegro Experimental Farm, given by the State of Para; and at Guimaraes, in Maranhao. Measures are also being taken for the installation of an apprentice school at Sao Simao, in the State of Sao Paulo. Technical agricultural instruction is given by traveling professors and instructors apportioned to different zones in accordance with their respective productions.

Two permanent dairy schools have been opened, one at Sao Joao del Rey, and the other at Barbacena, and the government is considering the establishment of a school of horticulture in some suitable locality. A bill authorizing the establishment of schools of practical plowing and stations for the experimental culture of tobacco, cotton, and cereals at Angatuba, Porto Feliz, Capao Bonito do Paranapanema, Guarehy, and Sarapuhy was approved December 17, 1912.

New Schools of the Royal Imperial Horticultural Society of Vienna.—The *Oesterreichische Garten-Zeitung* announces that this society has extended the winter course of the horticultural school at Vienna to a 2-year course, and has opened professional horticultural continuation schools at Mödling, Kagran, Simmering, and Klosterneuburg.

Tenth International Veterinary Congress.—This congress is to be held in London, August 3 to 8, 1914, and will be organized into five sections, as follows: Section 1, veterinary science in relation to public health; section 2, pathology and bacteriology; section 3, epizootiology; section 4, veterinary medicine and surgery; and section 5, tropical diseases. The subjects to be discussed at the general meetings are, (1) foot-and-mouth disease, (2) tuberculosis, (3) epizootic abortion, and (4) public control of the production, distribution, and sale of milk.

Dr. L. Van Es, of the North Dakota College and Station, has been designated chairman of the national committee for the United States to assist in the organization of the congress, with Dr. Adolph Eichhorn, of the Bureau of Animal Industry of this Department, as secretary.

EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director*.
Assistant Editor: H. L. KNIGHT.

EDITORIAL DEPARTMENTS.

Agricultural Chemistry and Agrotechny—L. W. FETZER, Ph. D., M. D.
Meteorology, Soils, and Fertilizers—W. H. BEAL.
Agricultural Botany, Bacteriology, and Vegetable Pathology {W. H. EVANS, Ph. D.
W. E. BOYD.
Field Crops {J. I. SCHULTE.
G. M. TUCKER, Ph. D.
Horticulture and Forestry—E. J. GLASSON.
Foods and Human Nutrition {C. F. LANGWORTHY, Ph. D., D. Sc.
H. L. LANG.
Zootechny, Dairying, and Dairy Farming—E. W. MORSE.
Economic Zoology and Entomology—W. A. HOOKER, D. V. M.
Veterinary Medicine {W. A. HOOKER.
L. W. FETZER.
Rural Engineering—R. TRULLINGER.
Rural Economics—B. B. HARE.
Agricultural Education—C. H. LANE.
Indexes—M. D. MOORE.

CONTENTS OF VOL. XXIX, NO. 2.

	Page.
Editorial notes:	
The Tenth International Congress of Agriculture.....	101
The quarter centennial of Prof. Thorne's directorship.....	106
Recent work in agricultural science.....	107
Notes.....	195

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Industrial chemistry, edited by Rogers, Aubert, et al.....	107
Progress made in chemistry as applied to the fermentation industry, Mohr....	107
Landolt-Börnstein physical-chemical tables, edited by Börnstein and Roth...	107
A humidity regulator, Clark.....	107
Fat analysis and fat chemistry in the year 1911, Fahrion.....	108
The density and solution volume of some proteins, Chick and Martin.....	108
The quantitative determination of aliphatic amino groups, II, Van Slyke.....	108
Studies in regard to the compounds in soil, Valmari.....	108
The chemistry of honey, Haenle.....	109
Chemical changes produced in cows' milk by pasteurization, Rupp.....	109
Elm-seed oil, Pawlenko.....	110
Antiseptic tests of wood preserving oils, Dean and Downs.....	111
Apparent disappearance of the higher boiling phenols in creosoted wood, Cabot..	111
[The poison in water hemlock], Jacobson.....	111
Reducing and nonreducing sugars in mangels, Stephani.....	111
Determination of sucrose in the presence of reducing sugars, Lemeland.....	112
Tables for calculation of available sugar and crystal content, Prinsen Geerligs ..	113

	Page.
Sugar beet analysis, 1910-11, Carter and Auld.....	113
Yearly report on sugar manufacture, Boch.....	113
The sugar-beet industry of Germany, Price.....	113
Micro-organisms of maple sap.—I, Influence on the sirup, Edson.....	113
Micro-organisms of maple sap.—II, Discussion of data on maple sirups, Jones.....	115
The preservation of fruit and legumes, Rolet.....	116
Fruit juices, Meunier.....	116
The fermentation of quince juice, Itô.....	116
A new fermenting <i>Monilia</i> , <i>Monilia vini</i> n. sp., Osterwalder.....	116
The diminution of acidity in fruit and berry wines, Becker.....	117
The diminution of acidity in wine, Omeis.....	117
Decrease in acidity of unsugared and sugared wines, Halenke and Krug.....	117
Deacidifying wine by the addition of precipitated calcium carbonate, Omeis.....	117
[The utilization of the residues, seeds, etc., from wine making], Paris.....	117
Preparation of olive conserves by lactic-acid fermentation, Trabut.....	117
Bleaching and decolorization of olive oil.....	118
Alcohol industry of Philippines.—Fermented beverages, Gibbs and Agcaoili.....	118
An investigation on the manufacture of tea, Sawamura.....	118
The extraction of nicotin from tobacco, Edwardes-Ker.....	118
Bibliography of the pulp and paper industries, Surface.....	119
Reports of some Austrian experiment stations.....	119
Report of Royal Agricultural-chemical Station at Vienna, Dafert and Kornauth.....	119
Report of the chemical station at Alnarp, 1911, Weibull.....	119
Report of chemical laboratory of Swedish Moor Culture Station, von Feilitzen.....	119
Report of the agricultural-chemical laboratory at Udine, Feruglio.....	119
Report of the laboratory of the Royal Institute at Klosterneuburg.....	119
Subject and author index to <i>Biochemische Zeitschrift</i> , Neuberg.....	120

METEOROLOGY—WATER.

Meteorology and agriculture, Shaw.....	120
Forecasting the weather, Bliss.....	120
Forecasting frost in the North Pacific States, Beals.....	120
A method of classification of winters, Angot.....	120
Bulletin of the Mount Weather Observatory.....	120
Hurricanes of the West Indies, Fassig.....	120
Monthly Weather Review.....	120
Summaries of climatological data by sections.....	121
Meteorological observations, Stevens.....	121
Meteorological observations at Massachusetts Station, Ostrander and Angier.....	121
Relation between the precipitation and stream flow at Cincinnati, Smith.....	121
The effect of atmospheric conditions on the hardness of rain water, Wolff.....	122

SOILS—FERTILIZERS.

The limitation of bacterial numbers in normal soils, Russell and Hutchinson.....	122
The complexity of the micro-organic population of the soil, Russell.....	123
A method for the determination of the number of Protozoa in soils, Rahn.....	123
Weathering of silicates and rocks with special reference to humus, Niklas.....	123
Investigations on humus acids, Gully.....	124
Behavior of amino acids in the soil, Jodidi.....	124
Osmosis in soils.—Soils as semipermeable membranes, I, II, Lynde and Bates.....	124
Studies on evaporation, Demolon and Brouet.....	125
Lysimeter investigations, 1912, Krüger.....	125
Soils of the Sutter Basin.....	125
Soil conditions of the river plains regions of Bavaria, Bauer and Weigert.....	125
What the United States is doing toward soil fertility, Cameron.....	125
Report on cooperative fertilizer and variety tests, Zealand, 1912, Larsen.....	125
Factors relating to the availability of nitrogenous plant foods, Lipman et al.....	126
The world's consumption of nitrogen, 1911-12, Bertrand.....	126
Oxidation of atmospheric nitrogen and resulting industries in Norway, Eyde.....	126
The Norwegian nitrate industry, Eyde.....	126
Experiments on the method of applying sodium nitrate, Demolon and Brouet.....	126
Synthetic ammonia, Bernthsen.....	127
Composition, toxicity, and evolution of crude ammonia, Demolon.....	127
The fixation of ammoniacal nitrogen by permutite and clay soils, Hissink.....	127

	Page.
Cyanamid, dicyanamid, and lime nitrogen, De Ruijter de Wildt and Berkhout	127
The Serpek process for the manufacture of aluminum nitrid, Richards	127
Bicalcic phosphate from electrolytically produced acid and alkali, Palmaer	128
The phosphate deposits of continental North America, Brown	128
Potash from seaweed in Mexico	128
[Production of potash salts and other fertilizers in Germany in 1912]	128
How lime is distributed through and lost from soils, Broughton	128
The rôle of the infinitely small in agriculture, Bertrand	129
Fertilizing value of certain industrial wastes	129
The waste liquors from the sulphite-cellulose industry and their use, Stutzer	129
New mineral fertilizer, Woods	129

AGRICULTURAL BOTANY.

The effects of artificial shading on plant growth in Louisiana, Shantz	130
The effects of ultraviolet rays on vegetation, Stoklasa et al.	130
Preliminary note on coagulation of proteins by ultraviolet light, Bovie	130
Temperature coefficient of coagulation caused by ultraviolet light, Bovie	131
Forcing plants with radium, Molisch	131
The influence of thorium X on sprouting plants, Kahn	131
Recovery from hail wounds on woody plants, Voges	131
Toxicity of smoke, Knight and Crocker	131
A delicate test seedling, Crocker, Knight, and Rose	132
Formaldehyde in the sap of green plants, Angelico and Catalano	132
Conditions affecting the development of lycopin in the tomato, Duggar	132
Formation of tannase in <i>Aspergillus niger</i> and <i>Penicillium</i> sp., Knudson	132
Microchemical study of hydrocyanic acid in <i>Prunus laurocerasus</i> , Peche	133
The assimilation of free nitrogen by <i>Azolla</i> , Oes	133
Synthesis of amids through ammonia absorbed through roots, Prianchnikov	133
Observations on a fungus living on fatty hydrocarbons, Gola	133
Relation of bacteria, yeasts, and mold fungi to iodine, Kossowicz and Loew	133
Studies of osmotic pressure, Brannon	133
Osmotic pressure and sodium chlorid content of leaves of nonhalophytes, Lewis	134
Distribution of osmotic pressure in relation to water conduction, Hannig	134
Protoplasmic contractions caused by distilled water, Osterhout	134
A chemical and physiological study of after-ripening of the Rosaceæ, Eckerson	134
The relation of ventilation to the respiration of fruits, Hill, jr.	135
The transpiration of barley with and without awns, Schulze	135
The heat of absorption of water in wood, Dunlap	135
Studies of the wild oat, Atwood	135
The problem of the origin of <i>Eurothera lamarckiana</i> , Davis	135
The variability of <i>Bacillus solanacearum</i> , Honing	136
Constant variants of <i>Capsella</i> , Hus	136
Preliminary note on inheritance of self-sterility in <i>Reseda odorata</i> , Compton	136
Root characters, ground water, and species distribution, Cannon	136

FIELD CROPS.

Second annual report of Paulding County experiment farm, McIntire	137
The work of the Truckee-Carson experiment farm in 1912, Headley	137
Duty of water, True	138
[Irrigation experiments and sugar-beet investigations], True et al.	138
Report of substitution of Swedish Seed Association at Luleå, 1911, Ulander	138
Field crop trials in Tromsø County, Larsen	138
Cooperative experiments, Clifton	138
Report on the Cawnpore Agricultural Station for 1912, Burt	138
Practical crop rotation, with special reference to catch crops, Eggers	139
The book of grasses, Francis	139
Report of breeding experiments with grasses and legumes, 1911, Witte	139
An irrigation experiment, Fischer	139
A simple demonstration of the action of natural selection, Harris	139
Berseem, or Egyptian clover (<i>Trifolium alexandrinum</i>)	140
A manual of clover culture, Pyre	140
The management of clover in corn belt rotation, Drake	140
Factors affecting the production of long-staple cotton, Cook	140
Egyptian cotton culture in the Southwest, Scofield	140

	Page.
Behavior of seed cotton in farm storage, Brand and Sherman.....	140
Couch grass (<i>Agropyron repens</i>), Kraus.....	141
Feterita, a new variety of sorghum, Vinal and Ball.....	141
History of the Wurttemberg hop culture, Nastold.....	141
Oats by pictures, Broili.....	141
Hulled oats, Buchholz.....	141
Proper growing and handling of potato seed stock, Woods and Morse.....	141
Shallu, or Egyptian corn.....	141
Soy beans and secrets of legume inoculation, Smith.....	142
Sugar-beet growing in Britain: Its effects on agricultural and rural life.....	142
Sugar beets in Germany, Austria-Hungary, and Belgium, Bruneant et al....	142
Three years' sugar-beet culture experiments, 1907-1909, Willner.....	142
Sugar-beet culture in Java, Smits.....	142
Cultivation of the teasel.....	142
Tor grass or false brome, and its eradication from down pastures, Hutchinson..	142
Breeding experiments with winter wheat at Svalöf, 1910-1912, Nilsson-Ehle..	143
Some germination experiments, 1910-11, Heinrich.....	143
Seed analyses: Their interpretation and use, Armstrong.....	143
The application of the precipitin method in testing seeds, Zade.....	144
Adulteration of Kentucky blue, redbtop, and orchard grass, Galloway.....	144
Seed inspection.....	144
Report of seed tests for 1912, Tillman.....	144
The study of agricultural seeds, Borlase.....	144
The Indiana weed book, Blatchley.....	144
Goose grass (<i>Galium aparine</i>), Wiedersheim.....	144

HORTICULTURE.

[Horticultural investigations in 1912], Seton.....	145
Report of horticultural fields, South Holland, 1912, Claassen et al.....	145
Celery culture in Michigan, Halligan.....	145
Cucumbers as a cash crop, Postiff.....	145
Greenhouse tomato investigations, Bouquet.....	145
Notes on Jamaican vegetables, Harris.....	145
Notes on fruits in Jamaica, Harris.....	145
Orchard spraying experiments in 1912, Morse and Yeaton.....	145
Lime-sulphur as a summer spray, Norton and Symons.....	146
Spray and practice outline for fruit growers, 1913, Eustace and Pettit.....	146
Fungicide and insecticide inspection.....	146
Bud variation in relation to fruit markings, Kraus.....	147
Seedless and malformed fruits, Brown.....	147
Frost fighting investigations, Heller.....	147
[Horticultural investigations], Kennedy and Heller.....	147
Frost investigation work of 1912, Lewis and Brown.....	147
Variety adaptability, Lewis.....	147
Varieties of fruit recommended for planting in Utah, Batchelor.....	147
The use of fertilization in apple orchards, Stewart.....	148
Pruning the apple orchard, Batchelor.....	148
The drying of prunes, Brown and Bradford.....	148
A prune survey of Oregon, Lewis, Brown, and Bradford.....	148
Small fruit culture, Wilkin.....	148
The loganberry in Oregon, Gardner.....	148
Directions for blueberry culture, Coville.....	148
Cuttings from grafted grapes and grapes growing on their own roots, Baco.....	148
Ornamental trees and shrubbery, compiled by Wiley.....	148
Starting a lawn, Halligan.....	148
Rose geranium culture in Algeria, Ducellier.....	148
The violet book, Allen-Brown.....	148

FORESTRY.

Forest atlas of North American trees.—I, Pines, Sudworth.....	148
Municipal reclamation of waste lands, Heinly.....	148
Progress report of forest administration in Assam for 1911-12, Monro.....	148
Date sugar industry in Bengal.—Chemistry and agriculture, Annett et al.....	148

Causes of natural change in the latex of <i>Hevea brasiliensis</i> , Whitby.....	149
Chemical treatment of waste wood, Benson.....	149

DISEASES OF PLANTS.

The fundamentals of general phytopathology, Klebahn.....	150
Diseases of agricultural crops, Legault.....	150
Some important plant diseases of Oregon, Jackson, Barss, and Bailey.....	150
Plant protection, Stebler.....	150
Injury to soil by noxious substances produced by fungus parasites, Pantanelli..	150
Control of stalk nematodes (<i>Tylenchus devastatrix</i>), Van Luijk.....	151
Sensitiveness of cereals to fungicidal treatment in 1912, Müller and Molz.....	151
Dry spot of oats, Clausen.....	151
Dry spot of oats, Krüger and Wimmer.....	151
Premature death of wheat, Grosser.....	151
Susceptibility of wheat to stinking smut and time of seeding, Munerati.....	151
Smut experiments.....	152
A root disease of <i>Paspalum dilatatum</i>	152
A hitherto but little recognized potato disease (<i>Hypochnus solani</i>), Eriksson...	152
Infection experiments with <i>Phytophthora infestans</i> , Garbowski.....	153
Pests and diseases of sugar beets, 1912, Fallada.....	153
Root tumors, Stift.....	153
A dry rot of sweet potatoes caused by <i>Diaporthe batatas</i> , Harter and Field....	153
Apple tree anthracnose, Jackson.....	153
The "rough-bark" disease of the Yellow Newtown apple, Roberts.....	154
Sooty blotch on apples, McClintock.....	154
Cherry gummosis, Barss.....	154
Pear rust (<i>Gymnosporangium sabinae</i>), Scheibener.....	155
The black knot of plums, Coons.....	155
The germination of the winter spores of grape downy mildew, Ravaz and Verge..	155
Some investigations on the development and treatment of downy mildew, Faes..	155
Diseases of cacao and means for their control, Martinez.....	155
Canker of oleander, Tonelli.....	156
The supposed European origin of the American chestnut canker, Pantanelli..	156
Studies on black canker of chestnut trees, Petri.....	156
A leaf spot of <i>Eucalyptus pulverulenta</i>	156
Drying of larch needles due to <i>Cladosporium laricis</i> and <i>Meria laricis</i> , Fiori....	156
Micro-organisms of maple sap.—III, Descriptions, Edson and Carpenter....	157
Fruiting bodies of dry rot fungus, Havelík.....	157
Recent observations on dry rot, Havelík.....	157
The wetting power of fungicides, Fonzes-Diacon.....	157

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Index zoologicus, II, Waterhouse, edited by Sharp.....	157
Plague eradication in Porto Rico, Creel.....	158
[Report of] department of entomology, Doten.....	158
Report of department of entomology, Doten.....	158
Report of the department of entomology.....	158
Check list of California insects, IV, Woodworth.....	158
Host index to California Coccidæ, Baker and Essig.....	158
The grape leafhopper, Quayle.....	158
A few facts concerning the fruit flies of the world, Compere.....	158
Observations on the life history of a new species of <i>Psychoda</i> , Welch.....	159
<i>Stomoxys calcitrans</i> , Brain.....	159
Wistaria gall fly (<i>Agromyza schineri</i>), Amundsen.....	159
<i>Psoroptes communis ovis</i> .—Ova and ovipositing, Stockman and Berry.....	159

FOODS—HUMAN NUTRITION.

Mutton and its value in the diet, Langworthy and Hunt.....	159
Natural immunity in the development of fertile hens' eggs, Ružička.....	159
The influence of cooking on the physico-chemical behavior of milk, Grosser...	160
Differences between graham and imitation graham flours, LeClerc and Jacobs..	160
The manufacture of a sweet flour from the sugar beet, Aulard.....	161

	Page.
Hop sprouts, an early spring salad	161
Fungi and composition of Japanese tamari-koji, Hanzawa	161
Roselle, Pratt	161
The nitrogenous constituents of lime juice, Funk	162
Homemade malt extract for nursing mothers, Willcox	162
Our national food supply, Lumsden	162
Food of the people and rising prices, Lichtenfelt	162
Fixation of the prices of meat in Barcelona, Algarra y Postius	162
Household statistics—an historical and methodological investigation, Albrecht	162
School feeding—its history and practice at home and abroad, Bryant	162
Food in health and disease, Davis	163
Modern theories of diet and their bearing upon practical dietetics, Bryce	163
A note concerning the influence of diets upon growth, Hopkins and Neville	164
Influence of food on the amylase content of human saliva, Evans	164
The differences in the peptic digestibility of wheat and oats, Klotz	164
The rate of protein catabolism, Cathcart and Green	164
The physiological nitrogen minimum, Thomas	164
[Metabolism in a diet poor in nitrogen] Zuntz and Schirokich	165
Advantages and disadvantages of calculating energy values, Krummacher	166
The hydrolysis of glycogen by diastatic enzymes, Norris	166
Metabolism of calcium and phosphoric acids in infants on cow's milk, Wolff	166
Metabolism of organic phosphorus compounds—hydrolysis by enzymes, Plimmer	166
Potassium excretion under normal and pathological conditions, Blumenfeldt	166
Changes in gaseous metabolism under muscular work, Lahy and Helitas	167

ANIMAL PRODUCTION.

Artificial climates for biological investigations, Prziham	167
Biochemical reactions, their inheritance and significance, von Dungern	167
The production of sperm iso-agglutinins by ova, Lillie	167
The effect of spermatoxin on the female organism and the egg, Tushnov	167
The parthenogenetic segmentation of the eggs of hybrid ducks, Chappellier	167
The intra-uterine growth cycles of the guinea pig, Read	168
Effects of castration on the hypophysis, Marrassini and Luciani	168
The histogenesis of the pineal body of the sheep, Jordan	168
Hypertrophy of testicles and comb after removal of the pineal gland, Foa	168
Physiological action of extracts of the pineal body, Jordan and Eyster	168
On errors of random sampling in certain cases, Greenwood, jr.	168
The domesticated animals of ancient Crete, Keller	169
Report of zoometrical studies made in 1912 at live-stock exhibits, Voiteiller	169
[Progress in live-stock breeding], Matthews et al.	169
The discussion of animal nutrition at Dundee, Russell	170
Information concerning the feeding of animals, Van Godtsenhoven et al.	170
The influence of food upon fertility in stock, Darnell-Smith	170
Effect of establishing permanent pastures on farm management, Bruchholz	170
Note on the chief fodder grasses of Indian forests, Hole	170
The feeding value of the horse chestnut, Auld	170
The evolution of the cattle industry, Gibson	170
The origin of Argentine cattle, Pillado	171
Crosses between Algau and African cattle, Spann	171
Jersey-Angus cattle, Parlour	171
Sheep-breeding experiments on Beinn Bhreagh [Nova Scotia], Bell	171
Deer breeding for fine heads, Winans	171
[European methods of feeding horses], Ashton	171
Horse breeding, Inchausti	171
Horse breeding in Prussia for the last 25 years, von Dettingen	171
Hints to poultry raisers, Lamon	171
The carbohydrate metabolism in ducks, Fleming	171
Ostrich breeding, Menegaux	172
Preservation of eggs by coating with paraffin	172

DAIRY FARMING—DAIRYING.

Dairy terminology, Martiny	172
Report of Alnarp Agricultural and Dairy Institute and School, 1911, Winberg	172
Further experiments on feeding dairy cows at Offerton Hall, Walker	172

Page.

Biological examination of the quality of milk, Paraschtschuk.....	172
Researches on bacteria in milk, Tidswell.....	173
Feed, and flavor and texture of cheese, Ubbelohde.....	173
Chemical composition of Portuguese cheese, Klein.....	173
Whey lemonade, Burri.....	173
The casein industry, Pedersen.....	173
Artificial milk, Gerlei.....	174

VETERINARY MEDICINE.

A new treatise on general pathology, compiled by Bouchard and Roger.....	174
General pathology and pathologic anatomy, edited by Lubarsch and Ostertag.....	174
Physical theory of immunity and its experimental basis, Gengou.....	174
The antigenic properties of split products of casein, Gay and Robertson.....	174
Normal hemagglutinins in human milk, von Zubrzycki and Wolisgruber.....	175
Autotherapy, Duncan.....	175
Maize, and hypersusceptibility against extracts, Cesa-Bianchi and Vallardi.....	175
Detection of erysipelas bacteria after vaccinating by Lorenz method, Wagner.....	176
Salvarsan in the treatment of surra in horses, dogs, and rabbits, Holmes.....	176
Specificity of immunity reactions with trypanosomes, Braun and Teichmann.....	176
Biochemistry and chemotherapy of tuberculosis, II, Corper.....	177
Biochemistry and chemotherapy of tuberculosis, III, Wells and Corper.....	177
The so-called "Much granules" in tuberculosis, Van Giesen.....	178
Vitality of tubercle bacilli proven by inoculation and inhalation, Chaussé.....	178
Bovine tuberculosis, Bidart.....	178
Etiology and significance of laryngeal and tracheal tuberculosis, Entress.....	178
Diagnosis of open pulmonary tuberculosis in bovines, Winkel.....	178
The reliability of the various tuberculin reactions, Tallgren.....	178
Difficulties encountered in diagnosis of tuberculosis by tuberculin, Eloire.....	179
The limitations of the tuberculin test, Hastings.....	179
Tuberculosis, McFadyean.....	179
Immunization against hemorrhagic septicemia, Mohler and Eichhorn.....	179
Hemorrhagic septicemia in the sheep in Scotland, McGowan and Rettie.....	179
Contagious agalactia of the sheep and of the goat, Carré.....	179
The precipitation reaction in hog erysipelas, Isabolinsky and Patzewitsch.....	179
A case of pustular dermatitis and pyemia in the horse, Mongrell.....	179
The cultivation of the virus of fowl plague, Landsteiner and Berliner.....	180
Polyneuritis gallinarum—etiology of beri-beri, Vedder and Clark.....	180

RURAL ENGINEERING.

Duty of water investigation.....	180
The flow of water in artificial channels: Clean pipes, Echols.....	181
Irrigation by pumping in western Kansas, Coburn.....	181
Irrigation with special reference to fruit growing in the Northwest, Powers.....	181
Irrigation experiment, Augstin.....	181
Porto Rico irrigation service, Wilson.....	182
Irrigation in Catalonia and Aragon, Morgan.....	182
Fifth biennial report of the state engineer of North Dakota, Atkinson.....	182
Proceedings of the fifth annual drainage convention, compiled by Pratt.....	182
The White Plains road experimental pavements, Connell.....	182
Public roads are public necessities, Pratt.....	183
Explosives in agriculture, Marks.....	183
Determining dimensions of retaining and storage walls, Hauska.....	183
Sand cement as used by the United States Reclamation Service.....	183
Value of washed sand and gravel in concrete.....	183
Action of acids, oils, and fats on concrete, Gadd.....	184
Electricity on the farm, Upson.....	184
Wind electricity, Freund.....	184
Practicability of generating electricity by wind power, Freund.....	184
Power from kerosene, Ellis and Dray.....	184
The gas, petrol, and oil engine, Clerk and Burls.....	184
New fuel for motor vehicles, Gunsaulus.....	184
Notes of agricultural tractors, Ringelmann.....	185
Standards in gas tractor construction, Brandon.....	185
An experience in steam [plowing], Jackson.....	185
Power plowing in the Philippines, Miller.....	185

	Page.
Motor plows and cultivating machinery, Luedecke.....	185
Competitive tests of cultivators and weed cutters, von Stockhausen.....	186
Trials with cultivators, Christensen and Dall.....	186
The grain drill, Gilmore and Milne.....	186
Practical country buildings, Radford.....	186
Planning the farm house, Chase.....	186
Conventional designs for agricultural engineers.....	186

RURAL ECONOMICS.

Interest paid by farmers on loans.....	186
Loans and credits granted on agricultural products in Russia.....	188
The noncooperative rural credit system of Japan, Shimooka.....	188
Rural cooperation, Lahitte.....	188
Waste in distribution, Van Hise.....	188
The economy of small holdings, Campbell and Turner.....	188
Agricultural laborers.....	189
Insurance against damage to crops by hailstorms.....	189
The potentialities of southern agriculture, Merry.....	189
Agriculture: Porto Rico.....	189
Agriculture as practiced in Germany, Owen.....	190
Pastoral life on the French Alps, Arbos.....	190
Crop Reporter.....	190
Prices of commodities in 1912, Sauerbeck.....	190
The church of the open country, Wilson.....	190
The country church and rural welfare.....	190

AGRICULTURAL EDUCATION.

Influence of educational institutions on agricultural science, Thatcher.....	191
Motive of the college of agriculture of the University of California, Hunt.....	191
First congress of agricultural education of Sao Paulo.....	191
Distribution of grants for agricultural education and research, 1911-12.....	191
Dairy instruction in foreign countries, Ellbrecht.....	191
Two kinds of agricultural education.....	191
New York high school course in farm mechanics and drawing, Howe.....	192
Course of study and manual of methods for Michigan district schools, Wright...	192
Elementary principles of agriculture, Ferguson and Lewis.....	193
Crops and methods for soil improvement, Agee.....	193
Agronomy.—A course in practical gardening for high schools, Clute.....	193
Chemistry applied to practical farming and home mixing fertilizers, Smith....	193
Manual of horticulture for grade and high schools, Busch and Gustin.....	193
The poultryman's handbook, McGrew and Shoemaker.....	193
Bird study in the schools, Libby.....	193
Suggestions for corn growing and conducting a contest, Schmitz and Hanger...	193
Organization and instruction in boys' corn-club work, Benson.....	193
Tomato growing as club work in the North and West, Corbett.....	193
Potato growing as club work in the North and West, Stuart.....	194

MISCELLANEOUS.

Twenty-fifth Annual Report of Illinois Station, 1912.....	194
Annual Report of Nevada Station, 1911.....	194
Annual Report of Nevada Station, 1912.....	194
Twenty-fifth Annual Report of Vermont Station, 1912.....	194
Finances, meteorology, index.....	194
Experiment Station Work, LXXIV.....	194

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

<i>Stations in the United States.</i>		<i>U. S. Department of Agriculture.</i>	
	Page.		Page.
Illinois Station:		Circ. 43.....	144
Twenty-fifth An. Rpt. 1912.....	194	Farmers' Bul. 526.....	159
Maine Station:		Farmers' Bul. 527.....	194
Bul. 208, Dec., 1912.....	121, 194	Farmers' Bul. 528.....	171
Bul. 209, Jan., 1913.....	129	Bureau of Animal Industry:	
Bul. 212, Mar., 1913.....	145	Bul. 166.....	109
Off. Insp. 46, Jan., 1913.....	144	Circ. 211.....	107
Off. Insp. 47, Feb., 1913.....	146	Bureau of Chemistry:	
Doc. 435.....	141	Bul. 164.....	160
Maryland Station:		Forest Service:	
Bul. 164, Feb., 1912.....	146	Bul. 123.....	119
Bul. 165, Feb., 1912.....	193	Forest Atlas, pt. 1.....	149
Bul. 166, Apr., 1912.....	128	Bureau of Plant Industry:	
Massachusetts Station:		Bul. 279.....	130
Met. Buls. 291-292, Mar.-Apr.,		Bul. 280.....	154
1913.....	121	Bul. 281.....	153
Michigan Station:		Circ. 122.....	137, 141, 148
Spec. Bul. 59, Mar., 1913.....	148	Circ. 123.....	140
Spec. Bul. 60, Mar., 1913.....	145	Doc. 803.....	193
Spec. Bul. 61, Mar., 1913.....	146	Doc. 883.....	193
Circ. 19, Apr., 1913.....	145	Doc. 884.....	194
Circ. 20, Apr., 1913.....	148	Bureau of Soils:	
Nevada Station:		Circ. 79.....	125
An. Rpt. 1911.. 111, 138, 147, 158, 194		Bureau of Statistics:	
An. Rpt. 1912..... 138, 147, 158, 194		Crop Reporter, vol. 15, No. 4,	
Ohio Station:		Apr., 1913.....	186, 190
Bul. 258, Feb., 1913.....	137	Weather Bureau:	
Oregon Station:		Bul. 40.....	121
Bien. Crop Pest and Hort. Rpt.		Bul. 41.....	120
1911-12.....	145,	Bul. 42.....	120
147, 148, 150, 153, 154, 158		Bul. W, sects. 1-57.....	121
Utah Station:		Bul. W, sects. 58-106.....	121
Circ. 8.....	147	Bul. X.....	120
Circ. 9, Mar., 1913.....	148	Bul. Mt. Weather Observ., vol.	
Vermont Station:		5, pt. 4.....	120
Bul. 167, June, 1912.....	113, 115	Mo. Weather Rev., vol. 41,	
Twenty-fifth An. Rpt. 1912..	157, 194	Nos. 1-2, Jan.-Feb., 1913.	120, 181

ILLUSTRATION.

FIG. 1. Humidity regulator, general view-----	Page. 107
---	--------------

EXPERIMENT STATION RECORD.

VOL. XXIX.

AUGUST, 1913.

No. 2.

The Tenth International Congress of Agriculture was held at Ghent, Belgium, June 8 to 11, in connection with the International Exposition. The attendance was not large, but twenty-five countries were represented. Some very interesting conferences took place, although many of the questions considered were of more immediate application to European conditions.

The congress was organized by the selection of Messrs. Helleputte and Méline as honorary presidents, Baron van der Bruggen, a former Belgian minister of agriculture, as president, J. Maenhaut as president of the executive committee, Paul de Vuyst as secretary-general, and Henry Sagnier as honorary secretary-general. Vice presidents were selected from the various countries represented, Dr. A. C. True, the delegate of this Department to the congress, being chosen for the United States.

Hon. Jules Méline, of France, president of the International Commission of Agriculture, delivered the opening address. In this he announced the conversion of the former committee of arrangements for these congresses into a permanent international commission with headquarters at Paris. This now comprises about one hundred members and holds regular sessions for the consideration of questions of interest. An innovation decided upon by the commission as regards the program was the substitution for many of the minor questions hitherto discussed by the congress of a single topic of large significance for extended discussion. The topic selected for this congress was rural depopulation. M. Méline presented statistics to show that this was already sufficiently serious to diminish appreciably the wheat and beef production of the world. The remedy, in his opinion, lay in increasing the attractiveness of rural life.

The discussion of rural depopulation was continued in the section on rural economy, the first of the five sections into which the congress was divided. Especial attention was given to the discussion of the advantages of large *v.* small holdings. The breaking up of large estates into holdings of a size assuring the holders of independence was advocated by Dr. E. Laur of Switzerland, who also favored the restriction of emigration and the improvement of agricultural

conditions by legislation. Much difference of opinion developed as to the optimum size of farm properties and the extent to which governmental assistance should be given in their acquisition.

The earnestness of the debate on this question reflects quite clearly the importance now attached to the problems of land ownership and management in the European countries. Public attention is being more and more drawn to them and they are entering more fully on the stage of political and legislative action. To appreciate the significance of the discussions abroad on this subject the American reader must have a good understanding of the complicated European systems of land tenure and management, as well as of the character of farm operations in those countries.

Besides the purely economic questions involved in this problem, there are many matters of sentiment, tradition, and social customs and institutions. The prevailing methods of intensive cultivation of the soil with hand tools necessarily call for relatively large numbers of workers on the land. The holdings which single families can operate under such a system are necessarily small from the American point of view and the financial returns are also relatively small. With the spread of general and agricultural education, the consequent advance in standards of living, the differences in the economical operation of the farms by the use of large machines, and the application of scientific principles to agricultural practice, new conditions of the country-life problems are being rapidly created. Moreover the efforts to make the life of the workers in other industries more satisfactory by increasing the amount and regularity of their wages, shortening their hours of labor, and protecting them from hardships through insurance and pensions, are creating among the workers on the farms a very strong desire for improved conditions of work and life.

Considering the closeness of relations of the European countries, the discussion of these matters in international congresses where different points of view can be presented, and where the effort is to discover underlying principles on which action may be based rather than to meet local conditions, is very important. Countries like our own, where the general conditions of agriculture and country life are so very different from those in Europe, may also learn much from such discussions, and if nothing else, may come to see the importance of studying their agricultural conditions broadly with a view to shaping the development of their rural communities along permanently satisfactory lines.

The comparative importance of agriculture and other industries in different countries was discussed by F. Ryziger, who brought out the very great differences now existing. He showed that direct governmental aid to agriculture in most countries constitutes only about

one per cent of the total expenditures. The section favored additional studies along this line by the International Institute of Agriculture.

Other subjects considered by the section included agricultural co-operation, mutual agricultural insurance, and the organization of trade in agricultural products. An extended description of agricultural credit methods in various countries was presented by Baron de Hennek of Austria, and the principle of agricultural credit banks was indorsed by the section.

The second section of the congress dealt with agricultural science and education. A detailed summary as to the status of agricultural research in various countries was presented by M. Toussaint, and an extended discussion followed. Among the conclusions ratified by the section were the following: Research institutions should be directed by scientists trained in experimental work; educational institutions should provide special facilities for the preparation of research workers; the work of research should be separated, both as to location and supervision, from police duties and absolute freedom from dictation of results should be guaranteed; research workers should keep in touch with original work elsewhere, and they may well be assisted in this by the accompanying of publications by a short summary, the issuing by each nation of an abstract journal summarizing its work, and the extension of the publications of the International Institute of Agriculture at Rome to include abstracts of all research work. Each national department of agriculture should also provide a section for the dissemination and popularization of results.

A proposition to lessen errors in field experiments by insisting upon the conducting of all plot experiments in triplicate received much discussion, owing to the diverse requirements in experimental and demonstration fields. The debate served to bring out the general agreement that field experiments required special attention to eliminate as far as possible the sources of error and that as a rule there must be considerable repetition of such experiments in different seasons and soils to secure reliable and useful results.

It was agreed that each agricultural educational institution, irrespective of grade, should have available a tract of land for its work. No decision was reached as to the question of restricting stations attached to colleges to purely research work. Further consideration of a new system of classifying experiments on the basis of altitude instead of latitude was favored.

One session of the section was devoted to the subject of agricultural instruction. Following a discussion by M. Pastur, the section voted that the organization of professional agricultural education is highly desirable in every country and that instruction methods should be used which develop the child's powers of observation and reflection.

The section also favored beginning agricultural training at twelve years of age, and holding special courses arranged on a part-time basis for those engaged in farm work. It was the prevailing opinion that the agricultural work in special schools should be given by specialists and that normal courses should embody in their fourth year a large amount of practical work.

A. Delos presented a detailed report on instruction in traveling schools of agriculture in Belgium, discussing courses of study, general organization, personnel, and results. His resolution favoring the establishment in properly selected centers of temporary winter schools, with courses extending over several seasons, was adopted.

A summary of the principal scientific discoveries in agriculture was presented by M. Grégoire, in which he referred to the work on the determination of soil acidity by Christensen and of the biological examination of soils by Stoklasa and Russell, and the various methods of soil examination in use in different countries. M. de Vilmorin presented a general report on new methods of selection in breeding work.

Three special subjects were also taken up in this section, namely agricultural meteorology, the culture of hops, and viticulture. With reference to meteorology, the conclusions adopted were that farmers should possess some knowledge of meteorological science, especially as regards the interpretation of observations, and that public interest in such observations and their multiplication should be increased. In this connection it may be said that there is a general sentiment among agricultural scientists and leaders in Europe that the meteorological services in the different countries should give much more attention to the requirements of agriculture and that more extended and thorough investigation of the agricultural relations of meteorology is greatly needed.

Animal industry formed the general subject of section 3. The practical application of Kellner's production values was discussed, and the need for additional experimentation emphasized as a basis for action by the next congress. Difficulties in the way of recognizing the best animals for breeding purposes were pointed out and the opinion expressed that in addition to conformation and external signs recognition should be given to biological qualities, the experimental control of special traits, data available in herd books, the influence of consanguinity, etc. Existing bases of classification of races of domestic animals were criticized and a resolution adopted favoring their complete revision from the standpoint of modern biological knowledge.

The rural engineering section gave considerable attention to questions of soil reclamation and improvement, advocating international studies in soil physics such as are now in progress in Russia as a basis

for engineering work, as well as the extension of governmental aid in the reclamation of unproductive public lands. Reports on the need of training experts in agricultural machinery were submitted by M. Lonay and by J. B. Davidson of the Iowa College. Papers were also presented on agricultural tractors, the application of mechanical energy in agriculture, dry farming, and rural roads.

The section of economic forestry favored the conservation of forests by the purchase and administration by the state of tracts of protective value and the furnishing of expert advice to owners of commercial holdings as well as the encouragement of reforestation. Methods of preventing and fighting forest fires were considered, and the formation of mutual insurance companies in which the state might participate was advocated. A temporary depression in the price of tan bark and firewood was reported in certain countries and the suggestion indorsed of offsetting this by a bounty on these products. The introduction of desirable foreign species and systematic experimentation as to their comparative behavior and economic possibilities was also favored.

At the closing session of the congress a proposition to organize an interparliamentary union of agricultural representatives was advocated by M. Maenhaut, who believed that such a body would do much to dignify the legislative status of agriculture and by annual meetings help to obtain action on measures of importance. This proposition met with considerable approval, and was referred to the permanent commission of agriculture. Additional members were selected for this commission as follows: Baron Rosenkranz of Denmark, Dr. A. C. True of the United States, Sir Sydney Olivier of Great Britain, Edmond de Miklos and Louis de Szomjas of Hungary, M. Croesen of Holland, and Count Louis de Vogüé of France. An invitation from the management of the Panama-Pacific International Exposition to hold the eleventh congress at San Francisco in 1915, in connection with the exposition, was referred to the commission for decision.

As at previous congresses, many social functions were arranged in honor of the delegates, including receptions by the King of Belgium and the Mayor of Ghent and several banquets. There were also numerous excursions to near-by points of interest. Following the congress sessions were held of the third International Congress of Associations of Agricultural Women and the second International Congress of Housekeeping Instruction.

The references to the International Institute of Agriculture at this congress indicated the growing realization of the value of the institute's work and the possibilities for its much greater usefulness. As an organization for the systematic collection and diffusion of

information on subjects connected with the world's agriculture, it is now generally recognized that the institute has made a permanent place. At the same time there is room and need for the international commission and congress of agriculture to provide a forum for the free and broad discussion of the ever-changing problems of agriculture and country life.

These two organizations may therefore supplement each other, and by cultivating close and cordial relations may together greatly strengthen and promote the world movement for the improvement of civilization through a better agriculture, and the more efficient and satisfactory organization of rural communities.

One of the most inspiring and gratifying returns for service is appreciation, and especially when it comes from those for whom the service has been primarily rendered. It is a rich reward. Such an expression of gratitude and esteem was recently accorded Prof. Charles E. Thorne, director of the Ohio Experiment Station, whose farsighted plans and persistent labors have made that station one of the largest and most influential in any State, and carried its name far beyond the confines of this country.

The occasion was the celebration of Professor Thorne's twenty-fifth anniversary as director of the Ohio Station, and the setting was the annual Field Day which has become an established institution at the station. Some five thousand persons gathered to do him honor and to listen to the tributes of appreciation and gratitude and high regard which were voiced by the speakers. The governor of the State was there, and many prominent men, but the assemblage was composed largely of farmers and citizens, a fact which it is safe to say gave special satisfaction and pride to the central figure of the day.

Rarely has a man been more worthy of the occasion. For his course has embodied the unselfish and all-absorbing will to serve his fellow men, and he has focused his attention on things that are worth while. In sharp contrast to superficial brilliancy which seeks quick and striking results, his work well exemplifies patient, determined thoroughness, an absorption in the search for controlling principles, an attitude which is all essential to success in working out the things that shall endure. These, with the calm, unbiased, conservative judgment of his interpretations, have given great confidence in his ultimate findings.

He sought no honor for himself and no other return than the advancement of agriculture on a safe and logical basis. His fidelity to his trust and to his opportunity make him worthy of all the confidence and esteem bestowed upon him.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Industrial chemistry, edited by A. ROGERS, A. B. AUBERT, ET AL. (*New York, 1912, pp. XIV+854, figs. 340*).—This large manual, which is intended for students in industrial chemistry and manufacturers, is edited by experts in their respective lines. The topics dealt with are as follows: Fertilizers; oils, fats, and waxes; the metallurgy of iron and steel; resins, oleo-resins, gum-resins, and gums; sugar; starch, glucose, dextrin, and gluten; brewing and malting; wine making; distilled liquors; casein; leather; and the art of paper making.

Progress made in chemistry as applied to the fermentation industry, O. MOHR (*Ztschr. Angew. Chem.*, 25 (1912), No. 22, pp. 1102-1110).—This is a review of the more important work in the fermentation industry during 1911. It deals with the chemistry and handling of raw materials, fermentation organisms, conducting the fermentation process, and the products of fermentation.

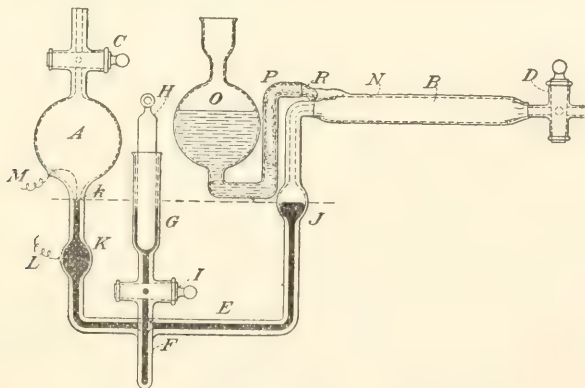


FIG. 1.—Humidity regulator, general view.

Landolt-Börnstein physical-chemical tables, edited by R. BÖRNSTEIN and W. A. ROTH (*Landolt-Börnstein Physikalisch-Chemische Tabellen. Berlin, 1912, 4. ed., rev. and enl., pp. XVI+1313*).—This is the fourth revised and enlarged edition of this well-known book of tables.

A humidity regulator, W. M. CLARK (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 211, pp. 6, figs. 2*).—Despite the fact that many devices have been used for the automatic maintenance of constant temperature, very little has been done in the way of constructing an apparatus for regulating humidity for scientific investigation in the field of plant physiology, or any other phenomena influenced by the humidity of the surrounding air.

For some studies in cheese ripening, a humidity-regulating apparatus was constructed which operates on the principle of the wet and dry bulb hygrometer. The apparatus (fig. 1) consists "of a dry bulb *A* and a bulb *B* kept moist by a

thin covering of wicking or muslin. This is fed with water from the reservoir *O*. For convenience in adjusting as well as for cleaning and filling both bulbs are provided with cocks, *C* and *D*. In order to present a convenient as well as a large surface, *B* is made cylindrical. The bulbs *A* and *B* are connected by the capillary tube *E*, partially filled with mercury. This tube is connected by a T-joint, *F*, to a leveling bulb, or preferably to a cup and plunger, *G* and *H*, by which the height of the mercury in the capillary may be adjusted. The cock *I* serves to open or break communication between the capillary and the leveling device. The bulbs *J* and *K* serve as mercury reservoirs and prevent accidental emptying of the capillary and consequent interchange of the gases in *A* and *B*.

"Electrical connection is made with the mercury by the sealed-in platinum wire *L*. Another platinum wire, *M*, is sealed in in such a way that its fused and smooth tip extends into the capillary at *k*. These wires are connected with a battery and relay, and are spanned with a condenser and a by-pass in order to eliminate sparking at the contact *k*.

"The operation of the regulator is as follows: The whole instrument is placed in a current of air whose humidity it is desired to regulate. Evaporation takes place on the moist bulb *B*, producing a cooling of the inclosed gas. The consequent reduction in pressure permits the excess pressure in *A* to drive the mercury away from the platinum contact at *k*. By this break in the circuit the relay is released in such a way that there is actuated a steam or water spray or a heating unit for raising the vapor tension of a body of water over which the air flows. As the humidity of the air is thus increased, the evaporation from *B* diminishes, and consequently the cooling. The pressure in *B* therefore regains its former value and contact is again made at *k*, the relay is actuated, and the source of moisture is shut off. For laboratories having electric current it will probably be found convenient to raise the vapor pressure by having the relay control an electric immersion heater plunged in a small vessel of water, and to have this vessel kept at constant water level, as is the Victor Meyer water bath."

Fat analysis and fat chemistry in the year 1911, W. FAHRION (*Ztschr. Angew. Chem.*, 25 (1912), No. 18, pp. 870-882).—This is a review of the work done in regard to the chemistry of fats during the year 1911.

The density and solution volume of some proteins, HARRIETTE CHICK and C. J. MARTIN (*Bio-Chem. Jour.*, 7 (1913), No. 1, pp. 92-96).—The density directly determined with dry specimens was from 5 to 8 per cent higher than that calculated from the specific gravity of concentrated solutions in the case of four proteins studied, showing the extent of shrinkage in volume occurring when these proteins went into colloidal solution.

The quantitative determination of aliphatic amino groups, II, D. D. VAN SLYKE (*Jour. Biol. Chem.*, 12 (1912), No. 2, pp. 275-284, pl. 1, fig. 1).—This method (*E. S. R.*, 26, p. 22), which has been employed in a great many investigations, has been improved in that several new pieces of apparatus have been introduced without increasing the cost or sacrificing any accuracy.

Studies in regard to the solubility and decomposability of the nitrogenous compounds present in the soil, J. VALMARI (*Abhandl. Agr. Wiss. Gesell. Finland*, 1912, No. 3, pp. 93).—As plants growing on moor soils rich in nitrogen often require an addition of nitrogenous fertilizers, a measure of the nitrogen present in such soils is something which is often desired. If this could be found by investigating the nitrogenous compounds present in such soils and the conditions under which they are soluble and decomposable, it would give a clew as to the appropriate measures to stimulate those processes of mobilization which occur in nature.

For extracting the total ammoniacal and soluble (assimilable) organic nitrogen, good results were obtained for high moor soils with decinormal sodium chlorid solutions used in the proportion of 20 or 40:1, for low moor soils fifth-normal sodium chlorid in the proportion of 10:1, and for mineral soils a one-half-normal sodium chlorid in the proportion of 2:1 of solution to soil.

In these extracts the ammoniacal nitrogen was first determined by distillation with magnesium oxid, and the soluble nitrogen by the Kjeldahl method. Nitrate nitrogen was determined in the same extract by adding magnesium oxid and some powdered alloy (prepared by fusing 60 parts of aluminum with 37 parts of copper and 3 parts of zinc) and heating. By this process the nitrate is reduced to ammonia. Where a large amount of organic matter was present a small amount of sodium hydroxid was added for the purpose of stimulating the reduction process.

The organic nitrogen compounds present in the soils examined, which came from Germany and Finland, consisted mainly of substances of a protein nature, and for the most part nucleins. The solution of these bodies is brought about by hydrolysis which results in the formation of amino acids and ammonia from the true proteins and from the nucleins certain nitrogenous compounds which belong to other groups are formed. Some of the organic matter was found to be hydrolyzed when the soil was merely boiled with water.

It is further noted that considerable amounts of organic nitrogenous compounds can be extracted from the soil by alkali solutions in the cold. The hydrolysis of the nitrogenous compounds was found to decrease with the extent of the decomposition of the soil. The solubility of nitrogenous compounds in diluted alkali solutions was higher for the more fertile soils. The nitrogenous compounds present in the more decomposed moor soils were more stable than those of the less decomposed moors. Those strongly decomposed contained larger amounts of readily soluble nitrogenous compounds than the less decomposed soil. Since this can not be ascribed to the greater solubility or decomposability of the organic nitrogen compounds, it is apparent that the factors which are active in stimulating the mobilization of the nitrogenous compounds, namely, the micro-organisms, act more favorably in the strongly decomposed soils.

At the beginning of this paper a historical sketch and a critical review are given of the work reported by previous investigators.

The chemistry of honey, O. HAENLE (*Die Chemie des Honigs. Strassburg, 1911, 4. ed., rev., pp. 80, fig. 1*).—A fourth edition of this work, which has for its purpose the differentiation of real honeys from those adulterated with invert sugar, glucose, or saccharose.

Chemical changes produced in cows' milk by pasteurization, P. RUPP (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 166, pp. 15, fig. 1*).—This investigation was undertaken because of the objections advanced from time to time against pasteurization as injurious to milk from a digestive and nutritive standpoint, especially as a food for infants. The points considered were (1) the changes in the phosphates, in order to show to what extent the soluble phosphate of lime becomes insoluble, (2) the extent to which the albumin was precipitated and the casein changed in its characteristic property of coagulating with rennin, and (3) the acidity of the milk.

For obtaining the milk serum, a clay filter prepared according to Soxhlet's method was used. In order to note whether the serum remained constant in composition during filtration, and for what length of time milk can be filtered at temperatures of 5 to 8° C. (41 to 46.4° F.) without bringing about a change in composition, some tests with skim milk were made. At the beginning of

filtration there was an absorption of both phosphoric acid and calcium, while magnesium passed through the cell wall; consequently the first 60 to 90 cc. of serum were rejected. The specific gravity of serum collected during the first 3 hours was 1.023, and during the next 18 hours it increased to 1.025, after which it remained constant. The acidity corresponded to 8.8 cc. of tenth-normal alkali for 100 cc. of serum on the first day, 9 cc. the second day, and on the fifteenth day 14.6 cc.

The phosphoric acid during the first 3 hours was 0.0753 per cent, but in the next 18 hours it increased to 0.1029 per cent. "On the second day it was 0.1054 per cent, and then remained constant until the tenth and eleventh days, when it began gradually to increase, amounting to 0.111 per cent on the fifteenth day. The calcium content was also low during the first 3 hours of filtration, amounting to 0.045 per cent, and it increased to 0.0554 per cent during the next 18 hours. On the second day it was 0.0581 per cent, and began to increase gradually as the acidity increased, amounting to 0.0683 per cent on the fifteenth day. The magnesium remained constant during the first 11 days and then increased very slowly up to the fifteenth day.

"The experiment shows, furthermore, that the filtration of a clean milk with low bacterial count can be continued for about 1 week without any appreciable chemical changes taking place in the serum, provided the temperature be kept at 6 to 8°."

After adding formaldehyde to milk it was found that when filtered it would furnish a milk serum which was constant after the first day's filtration at room temperature. The milk serum was subjected to 68° in order to get a maximum precipitation of phosphates. The changes produced by heating for 30 minutes were trifling. The phosphoric acid content remained the same in both the pasteurized milk and a sample of raw milk kept as a control. The quantity of lime salts was only a trifle lower in the pasteurized serum, and within the limit of error. The magnesia was the same in both sera. The variation in the quantity of lime salts was also found to be far greater between the 2 milk sera than between the raw and pasteurized sera, consequently the objections frequently raised against pasteurized milk as a food for infants on this ground are invalid.

As regards protein, it was found that "no albumin was coagulated on heating milk for 30 minutes at 62.8°, the temperature most commonly used in the holder process in commercial pasteurization. At 65.6° the separation of the albumin began, 5.71 per cent having become insoluble. At 68.3° the quantity increased to 12.76 per cent, while at 71.1°, 30.87 per cent of the albumin was coagulated."

As regards casein, it was found "that milk pasteurized at 55, 60, and 65° will coagulate more rapidly with rennin than does the raw milk. This result was obtained in all cases in a large number of experiments. At 70° the retardation of rennin coagulation began, while at 75° the time was about doubled and the coagulum was highly flocculent."

The acidity of pasteurized milk is discussed only slightly.

Elm-seed oil, A. PAWLENKO (*Chem. Rev. Fett u. Harz Indus.*, 19 (1912), No. 3, pp. 43, 44; *abs. in Jour. Soc. Chem. Indus.*, 31 (1912), No. 7, p. 345; *Analyst*, 37 (1912), No. 434, pp. 201, 202).—On extracting elm seed with petroleum spirit, 26.1 per cent of a greenish-yellow oil or fat was obtained which had the following characteristics: Specific gravity at 20° C., 0.9559; solidification point, 3.5°; melting point, 5.7°; acid value, 5.57; saponification value, 277.3; Hehner value, 75.45; Reichert value, 3.75; and iodine value, 32.2. The oil contained 56.2 per cent of capric acid and smaller amounts of oleic and butyric acids, and 14.82 per cent of glycerol. The shells, which are very brittle, represented 55 per cent of the whole seed, and contained 2 per cent of a hard, yellow, wax-like fat melting at 59.5°, and having a saponification value of 187. The decorticated seed,

after extracting the oil, contained 7.5 per cent of nitrogen, and its value as a feeding stuff is pointed out.

Antiseptic tests of wood preserving oils, A. L. DEAN and C. R. DOWNS (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 13 (1912), Sect. VIa, pp. 103-110; Jour. Indus. and Engin. Chem., 5 (1913), No. 2, pp. 126-129*).—These are the results of a laboratory study of the antiseptic powers of oils prepared from coal tar and water gas tar. The purpose of the work was to assist in arriving at a proper estimate of the place which water gas tar oil should occupy among timber preservatives. The organism used was *Polystictus versicolor*, obtained from decaying wood.

Oils distilled from water gas were found to have a distinct place among other preservatives (E. S. R., 27, p. 314).

The phenomenon of the apparent disappearance of the higher boiling phenols in creosoted wood and its explanation, S. CABOT (*Jour. Indus. and Engin. Chem., 4 (1912), No. 4, pp. 266, 267*).—The higher coal-tar phenols do not volatilize from creosoted wood but are present as insoluble and soluble complex oxidation products, which presumably have good antiseptic qualities. The oxidized phenols possess the three properties which are of prime importance in the preservation of wood, namely, nonvolatility, insolubility, and antiseptic power.

[The poison in water hemlock], C. A. JACOBSON (*Nevada Sta. Rpt. 1911, p. 40*).—The poison in water hemlock, locally called poison parsnip, is found to be entirely different in character and properties from the cicutin obtained from the European variety, since the Nevada form is neither an alkaloid nor volatile with steam. "It is a reddish-brown, waxy-looking substance, soluble in ether, alcohol, or other organic solvents. It is insoluble, but forms an emulsion with water. Its odor is characteristic and penetrating. It is a very inert substance chemically, but is precipitated with lead acetate. It is neutral to indicators, and possesses alcoholic properties. Racemic acid is obtained by oxidizing it with dilute nitric acid. Its physiological properties have been tested by feeding it to cats, rabbits, and guinea pigs, but these results will be published in connection with its complete discussion. Differing from cicutin, this substance is not present to any great extent in the seeds or stem of the plant, but mostly in the roots. It represents only from 0.6 to 0.7 per cent of the green weight of the root."

The investigation is being continued.

Investigations in regard to the reducing and nonreducing sugars in mangels during growth and storage, W. STEPHANI (*Kühn Arch., 1 (1911), pt. 1, pp. 107-182*).—Saccharose formation was found to take place in the leaves of mangels in the same manner as in sugar beets, and the sugar so produced passes into the roots without first undergoing inversion and is stored as a final reserve material.

During the first year's growth the amount of reducing sugars present is small (0.05 to 0.1 per cent), but in mangels rich in invert sugar it may be as high as 0.5 per cent. In beet roots it seems that saccharose is produced to only a very slight extent from the reducing sugars (monosaccharids). The varieties low in sugar have a larger amount of reducing sugars both during growth and storage than mangels high in sugar.

The polarimetric test can not be used as a basis for judging the nutritive value of stored mangels in the spring and after warm weather has set in. This is particularly the case with heavy croppers which have a low sugar content.

Under normal conditions feed beets having a medium and high sugar content, and stored up to the time when warm weather sets in, usually do not contain

more than 1 per cent of reducing sugars. Very often no difference is noted between the figures obtained by polarization and those obtained from the total sugar determination. In fact, in some instances the polarization gives higher figures than the total sugar determination despite the fact that an invert sugar content of from 0.5 to 0.8 per cent is present.

In growing beets for a high sugar content one is justified in selecting on the basis of the polarization test, providing this is done before spring. Although invert sugar possesses as high a feeding value as saccharose, it might be well to throw out those roots which show strong inverting properties when growing beets for a high sugar content. Such varieties use up a greater amount of sugar during the winter storage period. In growing feed beets with a high yield per acre, and which contain much water, it is proper to polarize in the fall because in such beets inversion takes place very rapidly during storage, and in many cases shows no rotation, or may show a levorotation even though the total sugar content may be appreciable. As there is no rapid and simple method for determining the total amount of sugar present the polarization method must form the basis for judging mangels.

Organic dry matter instead of total dry matter should be used as the basis for selecting beets grown for a high, dry substance content.

Method for the direct polarimetric determination of sucrose in the presence of certain reducing sugars, P. LEMELAND (*Jour. Pharm. et Chim.*, 7. ser., 2 (1910), No. 2, pp. 298-302; *Bul. Assoc. Chim. Sucr. et Distill.*, 28 (1911), No. 5, pp. 275-278; *Ztschr. Ver. Deut. Zuckerindus.*, 1912, No. 681, II, pp. 1192-1196; *abs. in Jour. Soc. Chem. Indus.*, 31 (1912), No. 21, pp. 1046, 1047; *Chem. Zentbl.*, 1912, II, No. 21, p. 1788).—Continuing previous work (E. S. R., 24, p. 611), the author finds that if hydrogen peroxid and a little manganese dioxid are added to a solution containing either arabinose, dextrose, levulose, galactose, or lactose, and heat applied, the optical and cupric reducing properties of these carbohydrates are destroyed. Sucrose or dextrans are not affected by this treatment.

“For the determination of sucrose in presence of any of the reducing sugars mentioned above, a solution of the sugars is heated in a boiling water bath with 0.5 gm. of manganese dioxid, or with 2 gm. if the quantity of reducing sugar present exceeds 10 gm. For every gram of reducing sugars present, a mixture of 2 cc. of 36 per cent sodium hydroxid solution and 30 cc. of hydrogen peroxid (German official preparation) is added little by little to the hot liquid; this operation may be completed in from 35 to 45 minutes. The solution is then cooled, neutralized exactly with dilute acetic acid, decolorized with charcoal or basic lead acetate, made up to a convenient volume, and polarized. . . .

“In analyzing mixtures containing a high proportion of reducing sugars to sucrose, advantage may be taken of the solubility of sucrose in 91 per cent alcohol, as in the following example: A mixture of 1 gm. of sucrose with 25 gm. of dextrose was left for 24 hours in contact with 100 cc. of 91 per cent alcohol, and shaken frequently. The undissolved portion was separated by centrifuging, and washed twice with 50 cc. of 91 per cent alcohol. The combined alcoholic solutions were distilled, after addition of a trace of calcium carbonate, and the residual liquid was treated with the oxidizing mixture as prescribed above. A polarimetric reading of $+1^{\circ} 14'$ was obtained instead of $+1^{\circ} 18'$ (control solution of pure sucrose). The new method can not be applied to mixtures containing maltose, for this sugar is not completely decomposed by the oxidizing mixture. Dextrans can be determined in presence of sugars other than maltose, any sucrose present being first inverted.”

Tables for the calculation of the available sugar, crystal sugar, and the crystal content of cane sugars of different composition, H. C. PRINSEN GEERLIGS (*Internat. Sugar Jour.*, 14 (1912), No. 161, pp. 274-278).—A series of tables are presented with which it is possible to calculate from the sucrose content of the juice and the purity coefficient the available sugar and crystal sugar in the juice. By another table the crystal content for any polarization of first sugar and for any water content can be determined. This table is valuable for calculating the quantities of sugar to standard muscovado.

Sugar beet analysis, 1910-11, R. H. CARTER and S. J. M. AULD (*Jour. Southeast. Agr. Col. Wye*, 1911, No. 20, pp. 276-285).—Altogether 62 samples were examined of which 34 came from the college farm. The methods of field and laboratory sampling, estimation of sugar in the beet and beet juice, and estimation of total solids in the juice are described.

The advantages of using the indirect method of analysis are its extreme rapidity, the possibility of expressing large quantities of pulp, representing many beets, and thereby giving an average sample more easily. In addition to this, the purity of the juice and the amount of solids not sugar present in the juice are determined. The direct method is deemed more scientifically accurate, but the indirect method gives concordant and comparative results.

Yearly report on sugar manufacture, J. BOCH (*Jahresber. Zuckerfabrik. [Stammer]*, 51 (1911), pp. X+278).—This is the 1911 edition of this well-known yearbook. Its contents are classified as follows: Agriculture, technology, chemistry, statistics, legislation, and patents issued.

The sugar-beet industry of Germany, H. C. PRICE (*Sci. Amer.*, 107 (1912), No. 7, pp. 134, 151, 152, figs. 3).—This article is a historical review and summary of the technical methods that have elevated the sugar-beet industry in Germany. It is well illustrated.

Micro-organisms of maple sap.—I, Micro-organisms occurring in maple sap and their influence on the color, flavor, and chemical composition of sirup, H. A. EDSON (*Vermont Sta. Bul.* 167, pp. 333-418, pls. 6, figs. 14).—Continuing similar work previously noted (E. S. R., 23, p. 369; 26, p. 825), it is shown that the number of micro-organisms per cubic centimeter of sour maple sap varied between 320,000 to 141,420,000 when grown on agar media. Assuming the size of the organisms to be 1 micron by 3 microns, this would represent one-third of the volume in the most heavily infected sap.

In sweet maple sap (14 samples) gathered under usual conditions, the micro-organisms varied between 140 to 1,000,000 per cubic centimeter when grown on agar. Those with a high count were obtained late in the season and they later developed an unpleasant flavor in the sap. Carefully collected sweet sap grown on agar showed between 5 and 500 per cubic centimeter, and several saps collected in covered scalded buckets ranged from 0 to 250. Saps collected under septic conditions, that is, those running sour, and some under aseptic conditions (by making a new tap 4 in. to one side of the old tap) showed in the case of the former, from 1,300,000 to 73,125,000 micro-organisms per cubic centimeter, and in the case of the latter, from 5 to 70 micro-organisms.

On a synthetic nutrient medium, in most instances the count was considerably lower than that found with agar.

Six trees were further tested in regard to the influence of tap-hole infection on the flavor of the sap, especially with reference to the time of sampling. "The figures given indicate that in most cases the infection in tap-hole and spout is slight during the early part of the season, but that it becomes more serious as the spring advances. In the case of one tree, however, there was a gradual, constant increase in the infection from the very first." The containers

used in the test were shown to have much to do with the increase of the micro-organisms.

It having been determined that large numbers of micro-organisms are intimately associated with the spoilage of sap, some field tests were made to determine their effect upon the quality of the sirup. Several hundred pure cultures of organisms were isolated from various types of spoiled sap, and a number of these were tested on other saps. In some cases the saps used for the purpose were obtained under comparatively aseptic conditions, whereas in others they were pasteurized before incubation. Following inoculation, and after a suitable period of incubation, the saps were concentrated to sirup under uniform conditions. Some late run but not heavily infected saps were also observed in the tests. The 128 sirups, after a period of keeping in the dark, were scored for flavor by an expert who knew nothing with reference to the history of the samples. Not a single case of contradiction as to grade occurred upon rearrangement and rescoring. In addition, the color, by the method proposed by Bryan (E. S. R., 24, p. 266), number of organisms, reaction, sucrose, invert sugar, and ratio of sucrose to invert sugar were determined, both before and after storing.

The organisms used in the inoculation tests were fluorescent organisms, non-fluorescent organisms from various sources, *Bacillus aceris*, gray yeast, red yeast, green mold, a composite culture of molds, yeasts, and fluorescent bacteria, or yeasts and bacteria, pink coccus, pink yeast, and organisms of the *B. subtilis* group (these were accidental infections). The yeasts in some instances did not develop well in the sap, consequently the bacteria gained the upper hand.

On comparing sirups made from inoculated sap with that from natural sour sap, it was found that those from the naturally infected saps were of the worst quality. The sirups showing the next greatest depreciation were those inoculated by the green fluorescent bacteria. "The spore-bearing bacteria, green molds, *B. aceris*, both groups of yeasts, and the natural sour material, occupy positions below the fluorescent group. . . . The statistical tables show that the dark color of late run sirup is to be attributed to the action of micro-organisms, since the sirups made from last run material gathered without infection were always of a light hue. The average depreciation in color as calculated upon the first run controls was 0.8 point. . . .

"Certain groups exercise a more detrimental influence upon color than upon flavor, while with other groups the reverse is true. The influence of each group appears more or less specific and characteristic. The most common form of organisms present in maple sap, the fluorescent bacteria, injures the flavor much less than it does the color. Those organisms which most seriously affect the flavor of sirup, the nonfluorescent, spore-bearing bacteria, molds, and stringy sap organisms, do not seriously darken the color. They do, however, frequently render the sirup cloudy and so viscid that it does not clear perfectly, even if left undisturbed for months. . . . In certain seasons these changes which produce the 'buddy' flavor may not occur in Vermont until after the sap flow ceases. In ordinary years, however, the season is interrupted by periods of growing weather, so that the vegetative activity of the tree is resumed some time before the final discontinuance of night freezes, and the influence of these physiological changes becomes manifest in the true buddy flavor which appears in the sirup. Formerly the opinion was commonly held that this depreciation was due to the presence of a relatively large proportion of invert sugar. The analytical data demonstrates that this view is erroneous. There is a decline rather than an increase in the content of invert sugar as the season advances. The exact nature of the cause of the true buddy flavor is unknown."

Methods of remedying the defects in maple sirup are described.

Micro-organisms of maple sap.—II, Discussion of physical and chemical data secured on maple sirups obtained from saps inoculated with micro-organisms, C. H. JONES (*Vermont Sta. Bul.* 167, pp. 419-474, pls. 2).—This portion of the bulletin deals with the analyses of the maple sirups discussed in the abstract above, and included 128 samples collected during 3 successive sugar seasons.

The average moisture content of the 26 samples collected in 1909 was 33.67, maximum 38.88, and minimum 29.44 per cent; of the 60 samples in 1910 the average was 38.01, maximum 47.6, and minimum 32.46 per cent; and of the 42 samples in 1911 the average was 30.39, maximum 38.97, and minimum 26.76. The remaining determinations made were color, flavor, score, sucrose, invert sugar, total ash, soluble ash, and malic acid value.

The summary of averages showed "the color averages 7.5, corresponding closely to first grade. The darkest color was obtained in the samples located in the 'sour sap, kept' group. This group also showed the highest depreciation from the control as regards color. The lightest color was secured in samples grouped under the captions 'tin buckets' and 'control.' The flavor averages 2.9, corresponding to a quality just below medium. The finest flavor was obtained in samples grouped under the term 'tin buckets' and 'control,' rating as 1 and 1.4, respectively; the poorest sample in this respect was located in the group denominated 'last run, sour,' which included several buddy sirups. Excluding the samples rating 5 and 6 in flavor (buddy) from the color and flavor averages, the average color and flavor figures thus revised for the remaining 116 samples are 7.5 and 2.6, respectively, equivalent to an average score of 719.

"The average moisture content for the entire 128 samples was 34.63 per cent. This was practically the moisture percentage of a standard 11-lb. to the gallon sirup. The average sucrose figures, 61.44 per cent, and the invert sugar percentage, 1.6 per cent, agree quite closely with the averages 62.64 and 1.49 per cent secured by H. Bryan [*E. S. R.*, 24, p. 266] in an examination of 395 samples from all parts of the United States where maple products are made."

"The invert sugar present in the sirups shows extremes, calculated to a moisture-free basis, of 0.12 and 28.35 per cent. Invert sugar results from the hydrolysis or inversion of sucrose, caused by yeasts, molds, bacteria, acids, etc. Thirty-two sirups, or a quarter part of the entire number of samples, carried less than 0.6 per cent of invert sugar on a moisture-free basis, while 57 samples, or 45 per cent, contained less than 1 per cent. Hence it seems fair to conclude that an invert sugar content in maple sirup of much more than 1 per cent can only be due to careless methods in handling or to delay in boiling the sap, or to the subsequent fermentation of the finished product."

"The average total ash figure on a moisture-free basis was 0.93 per cent, and extremes are 0.74 and 1.44 per cent. The minimum figures occur in the 'last run, sour' group and include considerable number of buddy sap samples. . . . Twenty-eight samples were deficient in total ash in amounts varying from 0.02 to 0.18 per cent. The deficiencies mainly occur among samples in the control groups. Eleven samples were low in insoluble ash, but the shortages were very slight, varying from 0.01 to 0.03 per cent, the latter figure occurring but once. There were 12 deficiencies in malic acid values, many of them being very small and ranging from 0.61 to 0.16 per cent."

"The average insoluble ash percentage was well over the standard in every group, the minimum being 0.29, the maximum 1.01, and the average 0.59 per cent.

"The malic acid value was likewise above the standard limit with a minimum of 0.71, a maximum of 1.21, and an average of 0.9 per cent. . . . The ash and

malic acid values of 34 of the samples examined were slightly below the standards used in determining the purity of maple products. . . . Ten of the 34 samples were 'controls;' 5 were 'last run sap, sweet,' 1 was inoculated with green mold, 6 with yeasts, 8 with bacteria, and 3 with mixtures of yeasts and bacteria. Hence, 15, or 44 per cent of the total number were not artificially inoculated. . . . A gradual drop in the total and insoluble ash contents and in malic acid value occurs as the concentration [of the sirup] increases."

"The grand average for the 128 samples secured in the 3 sugar seasons was in every particular typical of pure maple sirup, and would of course more nearly represent the output of that particular sugar orchard than would any single sample or minor group of samples."

The yeasts and molds, together with the spore-bearing bacteria, had the greatest inverting power. Some of the bacteria had very low inverting capacity. In studying the effect of diluting, boiling, and filtering on concentrated maple sirup a comparison was made with the analytical data obtained with the original samples. It is shown that by simply diluting and boiling the entire sirup, including its niter, to its normal density, with one exception all the samples thus treated showed an increased ash content, which enabled them to meet the standard required. The insoluble ash content was increased in each case. "This treatment resulted in an increase in total ash for the 11 samples of 1.27 per cent, averaging 0.115 per cent for each sample, with extremes from 0.02 to 0.21 per cent. The insoluble ash was increased 0.62 per cent, averaging 0.056 per cent, with extremes from -0.01 to +0.16 per cent. The soluble ash was increased 0.55 per cent, averaging 0.05 per cent, with extremes from -0.04 to +0.16 per cent. . . .

"This procedure seems to make it clear that the failure of several samples under discussion to meet standard requirements in certain particulars is not due to the influence of the inoculating organism employed, but rather to the overconcentration of the sample which, during the long period of sedimentation, caused a larger amount of niter to form and to settle out than would have formed and settled had the concentration been less and nearer that of the 11-lb. gallon."

The preservation of fruit and legumes, A. ROLET (*Les Conservees de Fruits. Paris, 1912, pp. 494, figs. 171*).—This book deals with the preparation of conserved fruits and legumes in the home and on a commercial scale. Its first part deals with the agencies and methods used in preservation. The publication is well illustrated.

Fruit juices, L. MEUNIER (*Ontario Dept. Agr. Bul. 200, 1912, pp. 31, figs. 17*).—This circular deals with chemistry and biology of cider and vinegar making, discussing apple juice and its fermentation, making and marketing unfermented, carbonated apple juice, cost of the plant, profits, and utilization of by-products.

The fermentation of quince juice, H. ITÔ (*Jour. Col. Agr. Imp. Univ. Tokyo, 1 (1911), No. 3, pp. 337-344, pl. 1; abs. in Chem. Zentbl., 1912, I, No. 9, p. 672*).—By mashing 47 kg. of quince 45 liters of quince juice was obtained. The wine therefrom had the following composition: Specific gravity at 18° C. 1.021, alcohol 6.4 per cent by volume, extract 8.112 per cent, sugar as glucose 3.883 per cent, glycerol 0.34 per cent, total acidity as tartaric acid 0.886 per cent, volatile acidity as acetic acid 0.6171 per cent, nonvolatile acidity as tartaric acid ester 2.69 per cent, volatile esters as acetic ether 0.084 per cent, nonvolatile esters as neutral tartaric acid diethyl ether 2.6 per cent, and ash 0.286 per cent. The fermenting agents were *Saccharomyces apiculatus* and *Torula pulcherrima*.

A new fermenting *Monilia*, *Monilia vini* n. sp., A. OSTERWALDER (*Zentbl. Bakt. [etc.], 2. Abt., 33 (1912), No. 11-14, pp. 257-272, pl. 1; abs. in Zentbl.*

Biochem. u. Biophys., 13 (1912), No. 5-6, p. 239).—From a fermenting apple cider a *Monilia* species was isolated which produces a bottom fermentation. This organism develops in a medium containing up to 12 parts per thousand of malic acid and is still capable of fermenting sugar when the solution contains about 4 parts of alcohol (by weight) per thousand. The products of fermentation are alcohol and volatile and nonvolatile acids, and the yeast is of particular significance for the after fermentation of wines. Dextrose and levulose are fermented the best, followed by saccharose, galactose, lactose, and maltose. Growth but no fermentation occurs with raffinose, arabinose, α -methylglucosid, and mannit. Cane sugar is fermented extracellularly.

The diminution of acidity in fruit and berry wines, H. BECKER (*Ztschr. Öffentl. Chem.*, 18 (1912), No. 17, pp. 325-337).—The chief results obtained in this investigation, which was made with 1910 and 1911 fruit and berry wines, were as follows:

(1) In the fermentation of apple wines a diminution of malic acidity takes place. In the case of currant and bilberry wines the loss was slight, while with gooseberry wine no loss at all was noted. The slight loss of acidity of berry wines was probably due to their high alcoholic content. (2) Where a decrease in malic acidity was noted there was a corresponding increase of lactic acid. (3) In fruit wines in all probability the lactic acid produced is a result of cleaving malic acid and sugar and as a secondary product of alcoholic fermentation. (4) In one case it was quantitatively determined that malic acid is cleaved to a greater extent than is shown by the titrations of the must (total and fixed acid). (5) The loss of acidity in the apple wine was noted most during the main fermentation process and subsequently.

The diminution of acidity in wine, T. OMEIS (*Arb. K. Gsundhtsamt.*, 42 (1912), pp. 597-603).—This is a continuation of work previously noted (E. S. R., 24, p. 308) and was done with Franconian wines. It deals particularly with the effect of temperature, stirring the yeast, alcohol content, and sulphuring upon the loss of acidity in these wines.

Comparative tests in regard to the decrease in acidity of unsugared and sugared Palatinate wines (1910), HALENKE and KRUG (*Arb. K. Gsundhtsamt.*, 42 (1912), pp. 607-622).—A continuation of work previously noted (E. S. R., 24, p. 308).

Deacidifying wine by the addition of precipitated calcium carbonate, T. OMEIS (*Arb. K. Gsundhtsamt.*, 42 (1912), pp. 604-606).—No foreign taste was acquired by wines which were treated with calcium carbonate. The use of this substance for reducing the acidity of wine, which is allowed in Germany, is favorably reported upon.

[The utilization of the residue, seeds, etc., from wine making], G. PARIS (*Staz. Sper. Agr. Ital.*, 44 (1911), No. 8-9, pp. 669-727).—This is a study of the probable methods of utilizing the residues from the wine press for various purposes, such as soap making, feed for animals, etc. In the chemical part of the work the results are given of studying the chemical composition of the material and the fat, ash, carbohydrates, tannin, and protein.

Preparation of olive conserves by lactic-acid fermentation, TRABUT (*Bul. Soc. Nat. Agr. France*, 72 (1912), No. 2, pp. 69, 70).—This is a description of a method used for preserving olives by a Spanish concern in Seville.

It consists of washing the olives in an alkaline water, and then placing them in casks containing salt water, in which fermentation is allowed to take place. A soapy, white froth is taken as an indication of the fermentation process. The liquor produced by the fermentation has an acid taste, which is possibly due to lactic acid and probably to acetic or perhaps another volatile acid. This acid medium was found to be a very good preservative for olives. The author has

used a process in France which is nearly identical for 12 years with good success.

Bleaching and decolorization of olive oil (*Ann. Falsif.*, 4 (1911), No. 33, p. 355; *abs. in Jour. Soc. Chem. Indus.*, 30 (1911), No. 17, p. 1071).—Olive oil is now being bleached with citric acid or tannin to meet a popular demand for a pale Italian olive oil. Tannin is given the preference, as it may be used either before or after filtration, or it may be added to the washing water. A favorite method seems to be to let the oil fall in a fine spray from a height of 6 meters into a tank filled two-thirds full with water, and where the mixture can be exposed to air and sunlight.

The alcohol industry of the Philippine Islands—Fermented beverages which are not distilled, H. D. GIBBS and F. AGCAOILI (*Philippine Jour. Sci., Sect. A.*, 7 (1912), No. 2, pp. 97-117, pls. 3).—This article deals with beer, basi made from sugar cane, and a liquor made from fermented rice. Three special reports from various districts in the Philippines on such drinks are included.

An investigation on the manufacture of tea, S. SAWAMURA (*Sci. Amer. Sup.*, 74 (1912), No. 1928, pp. 374, 375).—This deals with the effect of steaming on the activity of the enzymes of tea leaves, the effect of rolling on the solubility of tea, and the effect of firing on the chemical composition.

The extraction of nicotin from tobacco, D. R. EDWARDES-KER (*Jour. South-east. Agr. Col. Wye*, 1911, No. 20, pp. 327-351).—In spite of the great value of this substance as an insecticide, its extensive use by farmers and horticulturists is largely prevented by the high price of the pure alkaloid. The necessary technical details for the preparation of this alkaloid are trade secrets in the hands of a few manufacturers who are by this means able to control the price.

Before nicotin can be employed as a spray, it must be diluted with water to give a solution which contains not less than 0.075 per cent of nicotin. It was felt that the cost of a nicotin solution could be materially reduced if an aqueous extract of the leaf were prepared on the spot where the spraying was to be done.

In this investigation tests were conducted in regard to extracting tobacco on a small and large scale. "There is no need for the use of specially prepared acid or alkaline solutions in the removal of nicotin from tobacco leaves, ordinary water (hard or soft) at the ordinary temperature effecting an extraction of 96 per cent of the total alkaloid present.

"The water should be employed in the proportion of 1 gal. per pound air-dried leaves, and the latter should be treated with three successive quantities of water, in the same proportion. From every 1 lb. air-dried leaves there will thus be obtained 3 gal. nicotin solution which will generally require dilution to a certain extent before use as a spray. In the case of leaves containing 4 per cent nicotin the necessary dilution of the resultant liquid will be attained by the addition of 2 parts water to 3 parts solution.

"Although the cold water may be employed for extraction, a better result is obtained by the use of hot water. The temperature of the hot water should not be above 60° C. (140° F.), as otherwise a loss of nicotin may result through volatilization in the steam.

"One day for each extraction, making 3 days in all for each lot of leaves, is the length of time recommended, although this time can be reduced without entailing considerable loss of nicotin. The results . . . show [that] the most rapid extraction takes place during the first half hour of treatment, 97 per cent of the total nicotin present being removed by water at 60° after 3 successive treatments for this length of time.

"A 2½ per cent solution of soft soap extracts 1 per cent more nicotin at 60° than does soft water at that temperature. Hence if soap is to be ultimately used

in the spray, as is often the case, a slight advantage is gained by dissolving the soap in the water before rather than after extraction of the nicotine."

The other data reported upon are as to the keeping properties of tobacco extracts, the denaturing of tobacco, and field experiments on denaturing tobacco intended for spraying purposes. The best denaturants were found to be from 150 to 200 gal. of a 10 per cent copper solution and 50 gal. of turpentine per acre, applied separately by spraying on the growing leaves. The use of turpentine, however, would be impossible on a commercial scale owing to the high price of the substance.

Bibliography of the pulp and paper industries, H. E. SURFACE (*U. S. Dept. Agr., Forest Serv. Bul. 123, pp. 48*).—This bibliography of the pulp and paper industries includes formal works and treatises, important pamphlets and reprints, and a number of works on cellulose, which do not bear directly upon the pulp and paper-making industries. General reference works and periodicals which do not deal specifically with pulp and paper, but print material from time to time which is of importance to paper makers, are included in the appendix.

Reports of some Austrian experiment stations (*Ztschr. Landw. Versuchsw. Österr., 15 (1912), No. 4, pp. 324-563, pls. 5, figs. 8*).—These are the reports on the activities of the following stations for the year 1911: Royal Agricultural-Chemical Experiment Station at Vienna, by F. W. Dafert (pp. 324-418), with which is affiliated the Royal Bacteriological and Plant Protection Station; the Agricultural Chemical Experiment Station at Görz, by J. Bolle (pp. 419-454); the Royal Agricultural Teaching and Experimental Institute at Spalato, by J. Slaus-Kantschieder (pp. 455-491); the Royal Seed Control Station at Vienna, by T. von Weinzierl (pp. 492-547); the Royal Agricultural Experiment Station at Linz, by F. Hanusch (pp. 548-563).

Report of Royal Agricultural-chemical Experiment Station at Vienna, F. W. DAFERT and K. KORNAUTH (*Ber. K. Landw. Chem. Vers. Stat. Wien, 1911, pp. 100*).—This is a report of the activities of this station during 1911, including the affiliated Royal Bacteriological and Plant Protection Station.

Report of the chemical station at Alnarp, 1911, M. WEIBULL (*Malmö. Läns Hushåll. Sällsk. Kvartlsskr., 1912, No. 1, pp. 81-96*).—This is a report summarizing the results obtained from analyzing 6,076 samples of agricultural products, which consisted largely of dairy products, feeding stuffs, and soils.

Report of the chemical laboratory of the Swedish Moor Culture Station, 1910, H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr., 1911, No. 3, Bilaga, pp. 303-328*).—The report gives a summary of results obtained in the analysis of 1,019 samples of soils, lime, marl, fertilizers, harvested crops, peat, fuel, litter, etc.

Report of the agricultural-chemical laboratory at Udine, D. FERUGLIO (*R. Lab. Chim. Agr. Udine, Ric. Sper. e Attiv. Spiegata, 3 (1909-10), pp. 5-11, pls. 4*).—This is the report for the years 1909 and 1910 in regard to the functions and activities of the analytical laboratory at Udine, Italy.

Report of the experiment, chemical and pure yeast culture laboratory of the Royal Institute for Wine Manufacture and Fruit Culture at Klosterneuburg (*Programm u. Jahresber. K. K. Höh. Lehranst. Wein u. Obstbau. Klosterneuburg, 1911-12, pp. 97-141, figs. 4*).—Among the subjects discussed in this report are the results of analyzing musts and wines, a study of the distillation method for determining the losses which occur under ordinary conditions, the use of the von der Heide ether extraction apparatus for determining lactic acid in wine, the fermentation of some musts with and without pure yeast, the isolation and testing of some pure cultures of yeast, and the treatment of abnormal wine with milk or charcoal.

Subject and author index to *Biochemische Zeitschrift*, C. NEUBERG (*Biochemische Zeitschrift. General-Register zu Band 1-30. Berlin, 1912, pp. 402*).—This is the general index of this work for volumes 1-30, inclusive.

METEOROLOGY—WATER.

Meteorology and agriculture, W. N. SHAW (*Jour. Scot. Met. Soc., 3. ser., 16, No. 29, pp. 18-26*).—This is the full paper, brief reviews of which have already been noted (*E. S. R., 28, p. 414*). It discusses the losses due to adverse weather conditions, the possible value of forecasts in reducing such losses, and the separate elements of a good crop year, setting forth the need of the organization of the available statistics bearing on this question.

Forecasting the weather, G. S. BLISS (*U. S. Dept. Agr., Weather Bur. Bul. 42, pp. 34, figs. 4*).—The object of this bulletin is stated to be to present some of the generally accepted facts and theories of meteorology in an elementary form for wide circulation.

Forecasting frost in the North Pacific States, E. A. BEALS (*U. S. Dept. Agr., Weather Bur. Bul. 41, pp. 49, figs. 13*).—"The paper describes the evolution of the system of frost warnings for the protection of fruit in Washington, Oregon, and Idaho, and contains detailed reports of the conditions under which warnings were issued during the critical season in the spring of 1911 for the fruit districts of Boise, Lewiston, Rogue River Valley, and Yakima Valley. It discusses the meteorological conditions which afford an indication of the probable occurrence of frost and on which warnings may be based. The paper is accompanied by three illustrations showing Weather Bureau equipment for observing temperature conditions, sketches of the 4 fruit districts mentioned, 5 weather maps showing the conditions preceding frost, and a chart of composite thermograph curves."

A method of classification of winters, A. ANGOT (*Bul. Soc. Nat. Agr. France, 73 (1913), No. 3, pp. 186-188*).—The method proposed is to classify the winters by means of the sum of minimum monthly temperatures below 0° C. The method is applied to temperatures observed during the winters of 1872-73 and 1911-12 at Park Saint-Maur.

Bulletin of the Mount Weather Observatory (*U. S. Dept. Agr., Bul. Mount Weather Observ., 5 (1913), pt. 4, pp. 219-293, pls. 15, fig. 1*).—This number contains the following articles: Is the Average of Measurements the Best Approximation for the True Value or Normal Value? by E. L. Dodd; The International Radiotelegraph Conference of 1912; On Violent Uprushes in Cumulus Clouds (illus.), by W. J. Humphreys; Atmospheric Humidity as Related to Haze, Fog, and Visibility at Blue Hill, by A. H. Palmer; and Free Air Data at Mount Weather, Va., for July, August, and September, 1912 (illus.), by W. R. Blair.

Hurricanes of the West Indies, O. L. FASSIG (*U. S. Dept. Agr., Weather Bur. Bul. X, pp. 28, pls. 25*).—The subject is discussed under the heads of hurricane areas and hurricane tracks; frequency of hurricanes; progressive movement of hurricanes; duration and intensity of hurricanes; hurricanes, cyclones, and typhoons; signs of an approaching tropical cyclone; the hurricane of August 7-20, 1899; and origin of tropical cyclones.

Monthly Weather Review (*Mo. Weather Rev., 41 (1913), Nos. 1, pp. 1-170, pls. 10, fig. 1; 2, pp. 171-326, pls. 10, fig. 1*).—In addition to the usual climatological summaries, lake levels, weather forecasts and warnings for January and February, 1913, river and flood observations, lists of additions to the Weather Bureau library and of recent papers on meteorology, a condensed climatological summary, and climatological tables and charts, these numbers contain the following special papers:

No. 1.—January Flood in the Ohio Valley; Irrigation by Pumping in Western Kansas, by F. D. Coburn (see page 181); Notes on the Rivers of the Sacramento and Lower San Joaquin Watersheds during January, 1913, by N. R. Taylor; Notes on the Streams of the Upper San Joaquin Watershed, by W. E. Bonnett; Damage by Lightning Near San Francisco, by A. G. McAdie; Note on Weather at Fresno, Cal., during January, 1913, by W. E. Bonnett; Report on Recent Destructive Frosts in California, by A. G. McAdie; The Effect upon Atmospheric Transparency of the Eruption of Katmai Volcano (illus.), by H. H. Kimball; Mountain Snowfall Measurements, by B. C. Kadel; Interesting Solar Halo, by F. Slocum; Meteorology in the Far East; and [Note] to Observers of Meteors, by C. Abbe.

No. 2.—Floods in the Pascagoula and Pearl Rivers during January and February, 1913, by J. H. Jaqua; The Humidity of Air in Mines, by S. O. Andros; Ice Storm in Illinois, by C. J. Root and S. P. Peterson; Biographical notes on George Henrich and Whittaker Holden; Notes on the Rivers of the Sacramento and Lower San Joaquin Watersheds during February, 1913, by N. R. Taylor; Notes on the Streams of the Upper San Joaquin Watershed, by W. E. Bonnett; Fighting the Big Freeze (illus.), by J. E. Adamson; and Meteorological Observations at the University of California.

Summaries of climatological data by sections (*U. S. Dept. Agr., Weather Bur. Bul. W*, vols. 1, pp. [562], figs. 116; 2, pp. [508], figs. 99).—These are bound sets of summaries first issued by Weather Bureau stations, volume 1 embracing sections 1 to 57, west of the Mississippi River, and volume 2, sections 58 to 106, east of the Mississippi River, each volume also containing a title page and introduction.

Meteorological observations, J. S. STEVENS (*Maine Sta. Bul.* 208, pp. 467, 468).—Observations at Orono, Me., on temperature, precipitation, cloudiness, and wind during 1912 are compared with the means of similar observations for 44 years. The mean temperature for 1912 was 42.68° F., the mean for 44 years 42.49°; the precipitation for 1912 was 48.45 in., for 44 years 43.42 in.; the snowfall for 1912, 46 in., for 44 years 90 in.; the number of days on which there was a precipitation of 0.01 in. or more was 102, the number of clear days 105, and the number of cloudy days 99; and the total movement of wind in miles, 50,096.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and H. W. ANGER (*Massachusetts Sta. Met. Buls.* 291, 292, pp. 4 each).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during March and April, 1913. The data are briefly discussed in general notes on the weather of each month.

The relation between the precipitation over the watershed of the Ohio River above and the stream flow at Cincinnati, J. W. SMITH (*U. S. Dept. Agr., Weather Bur. Bul.* 40, pp. 40, figs. 4).—This subject is discussed on the basis of observations on precipitation at seven stations and on river stage records at Cincinnati during the 50 years from 1861 to 1910, inclusive. The conclusions reached are as follows:

“(1) River stages at Cincinnati depend upon the precipitation over the whole watershed above that city. (2) There has been a very slight decrease in flood days in recent years, with the same rainfall. (3) The same amount of rainfall causes a better flow of water in the river during the low-water period than formerly. The number of low-water days was 14 per cent less during the past 25 years than during the preceding 25, calculating for the same rainfall. During the 10 years ending with 1910 the tendency for low water, with an equivalent rainfall, was not so great as for any preceding 10-year period for the past 50 years. (4) Floods do not occur at Cincinnati during February and March

unless the precipitation for these months is in excess of the normal, except on very rare occasions. The number of flood days increase most rapidly when the precipitation during these months is about 3 in. above the normal or about one-half more than the normal."

The effect of atmospheric conditions on the hardness of rain water, S. WOLFF (*Jour. Soc. Chem. Indus.*, 32 (1913), No. 7, pp. 345-347).—Examinations of samples of rain water collected near Manchester, England, showed the presence of considerable amounts of calcium and magnesium salts and a high degree of hardness. The author concludes that the rain water carries down not only soot but other soluble or insoluble substances floating in the air, but which in ordinary air analysis might not be found in such appreciable quantities.

SOILS—FERTILIZERS.

The effect of partial sterilization of soil on the production of plant food. II, The limitation of bacterial numbers in normal soils and its consequences, E. J. RUSSELL and H. B. HUTCHINSON (*Jour. Agr. Sci.*, 5 (1913), No. 2, pp. 152-221, figs. 7).—Further investigations are here reported which, it is stated, confirm the conclusions of previous work (E. S. R., 22, p. 121) and produce further evidence "that bacteria are not the only inhabitants of the soil, but that another group of organisms occurs, detrimental to bacteria, multiplying more slowly under soil conditions and possessing lower power of resistance to heat and to antiseptics.

"In consequence of the presence of these detrimental organisms the number of bacteria present in the soil at any time is not a simple function of the temperature, moisture content, and other conditions of the soil. It may, indeed, show no sort of connection with them. Thus, rise of temperature is found to be ineffective in increasing the bacteria in the soil; increase in moisture content has also proved without action. The number of bacteria depends on the difference in activity of the bacteria and the detrimental organisms.

"But when soil has been partially sterilized the detrimental organisms are killed and the bacteria alone are left. It is then found that increase in temperature (up to a certain point) favors bacteria multiplication and causes the numbers to rise. Variations in moisture content also produce the normal results on partially sterilized, but not on untreated soils.

"The detrimental organisms are killed by any antiseptic vapor or by heating the soil to from 55 to 60° C.; they suffer considerably when the soil is maintained at lower temperatures (40°) for a sufficient length of time. Cooling to low temperatures also depresses them although it fails to kill them.

"The completeness of the process can be accurately gaged by the extent to which the bacteria suffer. Whenever the treatment is sufficiently drastic to kill the nitrifying organisms and to reduce considerably the numbers of the other bacteria (as shown by the counts on gelatin plates) it also kills the detrimental organisms. If the soil conditions are now made normal, and the antiseptic is completely removed, rapid increase is observed in the bacterial numbers and the rate of production of ammonia. A temporary or partial suppression of the factor is, however, possible without extermination of the nitrifying organisms.

"Once the detrimental organisms are killed the only way of introducing them again is to add some of the untreated soil. But the extent of the transmission is apt to be erratic, being sometimes more and sometimes less complete than at others; occasionally the infection fails altogether. We have not yet learned the precise conditions governing the transmission.

"Provisionally we identify the detrimental organisms with the active protozoa of the soil, but as the zoological survey is yet incomplete we do not commit ourselves to any particular organism or set of organisms or to any rigid and exclusive definition of the term protozoa.

"The increase in bacterial numbers following after partial sterilization by volatile antiseptics is accompanied by an increase in the rate of ammonia production until a certain amount of ammonia or of ammonia and nitrate has accumulated, when the rate falls. Thus two cases arise: (1) When only small amounts of ammonia and nitrate are present there is a relationship between bacterial numbers and the rate of ammonia production, (2) when large amounts of ammonia or of ammonia and nitrate are present there is no relationship. The limit varies with the composition and condition of the soil.

"Complications are introduced when the soil has been partially sterilized by heat, because heat effects an obvious decomposition of the organic matter, thus changing the soil as a medium for the growth of micro-organisms. The bacterial flora is also very considerably simplified through the extermination of some of the varieties. These effects become more and more pronounced as the temperature increases, and their tendency is to reduce the numbers of bacteria. We find maximum bacterial numbers in soils that have been heated to the minimum temperature necessary to kill the detrimental organisms (about 60°). Both bacterial numbers and the rate of decomposition in such soils approximate to those obtaining in soils treated with volatile antiseptics, and the above-mentioned relationships between these quantities also hold.

"Although bacterial numbers are at a minimum in soils heated to 100° the decomposition effected is at a maximum.

"With this exception it is generally true that bacterial multiplication may go on without increasing the rate of production of ammonia, but an increase in the rate of production of ammonia does not take place without bacterial multiplication.

"The increase in bacterial numbers brought about by addition of bacteria from the untreated soil into partially sterilized soil leads to still further production of ammonia and nitrate unless too large a quantity of these substances is already present. But the subsequent depression in bacterial numbers consequent on the development of the detrimental organisms is generally (though not always) without effect on the rate of decomposition, apparently because it does not set in until too late."

The complexity of the micro-organic population of the soil, E. J. RUSSELL (*Science, n. ser.*, 37 (1913), No. 953, pp. 519-522).—This article contains a re-statement of the author's conclusions regarding the relation of protozoa to bacterial activity in the soil and a reply to recent papers by other investigators (E. S. R., 27, p. 620; 28, pp. 323, 324, 719) taking issue with them. Recognizing fully the complexity of the soil fertility problem, the author reiterates his claim that destructive organisms are an important factor, although not the only one involved in the matter.

A method for the determination of the number of Protozoa in soils, O. RAHN (*Centbl. Bakt. [etc.]*, 2. Abt., 36 (1913), No. 15-18, pp. 419-421).—The method, which is a dilution method, is briefly described, and examples of results obtained by its use are given.

Chemical weathering of silicates and rocks with special reference to the influence of humus substances, H. NIKLAS (*Chemische Verwitterung der Silikate und der Gesteine mit besonderer Berücksichtigung des Einflusses der Humusstoffe*. Vienna, Berlin, and London, 1912, pp. XX+143; rev. in *Naturw. Ztschr. Forst u. Landw.*, 10 (1912), No. 11, pp. 559, 560).—This paper reports

results of original investigations on the influence of humus substances on the weathering of silicates, a brief account of which is given in an article previously noted (E. S. R., 28, p. 322). The paper contains in addition extensive reviews of present knowledge and a bibliography of the subject.

Investigations on humus acids, E. GULLY (*Landw. Jahrb. Bayern*, 2 (1912), Nos. 12, pp. 941-1024, figs. 2; 13, pp. 1025-1074; *Mitt. K. Bayr. Moorkulturanst.*, 1913, No. 5, pp. 135, figs. 2).—A continuation and extension of previous work (E. S. R., 23, p. 715) on the chemical composition and absorptive power of sphagnum in relation to the formation of upland moors is reported in detail. The results are discussed in their bearing upon the conclusions of Rindell (E. S. R., 26, p. 123) and Tacke and Stüchting (E. S. R., 26, p. 720), who hold, in opposition to the author, that there are free humus acids in the soil.

The chemical study of sphagnum showed that these plants took up more plant food than was needed for normal growth. The live sphagnum were always richer in plant food (potash, phosphoric acid, and nitrogen, as well as magnesia) than the dead. There was either no difference in lime or an increase in case of forest or meadow moors. The peat moss of the upland moors contained the least plant food, that of the low moors the most, while that of forest moors contained an intermediate amount, but the relative proportions in any case varied widely with the kind of sphagnum predominating. The absorptive power of the sphagnum for different salts varied with the plant food they already contained.

The author's further investigations confirm his previous conclusion that there are no humus acids, strictly so-called, and that Tacke and Stüchting's results can not be properly held to lead to the opposite conclusion.

Behavior of amino acids in the soil, S. L. JODIDI (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 26 (1912), *Seets. VIa-XIb, App.*, pp. 119-134).—The author found that amino acids, like acid amids (E. S. R., 28, p. 813), readily undergo ammonification in the soil, glycocoll yielding under the conditions of the experiments 81.03 per cent of ammonia, alanin 75.58, leucin 59.62, aspartic acid 72.74, glutamic acid 72.19, phenylalanin 54.31, tyrosin 59.65, and asparagin 77.47. "All other things being equal, the rate of transformation of the amino acid nitrogen into ammonia is greatly influenced by the chemical structure of the amino acids so that amino acids of equal structure yield about the same proportion of ammonia and vice versa."

Osmosis in soils.—Soils act as semipermeable membranes, I and II, C. J. LYNDE and F. W. BATES (*Jour. Phys. Chem.*, 16 (1912), No. 9, pp. 759-781, figs. 5; *Proc. Amer. Soc. Agron.*, 4 (1912), pp. 102-121, figs. 5; *abs. in Chem. Abs.*, 7 (1913), No. 5, p. 854; *Jour. Soc. Chem. Indus.*, 32 (1913), No. 2, pp. 99, 100; *Jour. Chem. Soc. [London]*, 104 (1913), No. 604, I, pp. 237, 238).—From a series of experiments in which air-dried subsoil was allowed to stand in water for about a week, then disintegrated, the mixture of soil and water sterilized, centrifuged, and the column of settled soil used in place of a membrane in an apparatus for measuring osmotic pressure, the authors conclude that a heavy clay subsoil acts as a semipermeable membrane and that water moves through such a subsoil from points of low concentration to points of high concentration, thus developing a certain osmotic pressure. The efficiency of the subsoil as a semipermeable membrane increased with the depth, and the osmotic pressure increased with the temperature.

The experiments substantiate the "theory that the soil acts as a semipermeable membrane only for the case of a heavy subsoil prepared in a certain way. It remains to be shown that it holds for soils under field conditions."

The application of the theory to tillage, drainage, fertilizing, and temperature of the soil is briefly discussed.

Studies on evaporation, A. DEMOLON and G. BROUET (*Sta. Agron. Aisne Bul.*, 1912, pp. 58-62). This is an account of a continuation of studies on factors affecting evaporation from soil (*E. S. R.*, 25, p. 115), the previous article dealing particularly with a special form of evaporimeter used.

The observations recorded showed the minimum of evaporation during periods of cloudiness and rainfall and the maximum evaporation during the prevalence of east winds. Direct solar action during the summer had an important influence on evaporation. Evaporation was reduced but still active during the night. Those agencies which reduced capillary circulation diminished evaporation and prevented it from attaining a maximum during hot summer days.

Lysimeter investigations, 1912, E. KRÜGER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg*, 5 (1913), No. 3, pp. 247-251).—The observations here reported were the same as those of previous years (*E. S. R.*, 27, p. 19). The results for 1912 were unusual on account of the abnormally wet season.

Soils of the Sutter Basin (*U. S. Dept. Agr., Bur. Soils Circ.* 79, pp. 10, fig. 1).—This is a brief report upon a resurvey of certain soils in the Marysville area, California, which was originally surveyed in 1909. The further study of soil conditions in this basin was made in view of "a proposed engineering project of considerable magnitude, involving protection of the lands of the basin by an extensive system of levees and artificial overflow channels and the draining of the lands by installation of pumping plants."

The soil conditions of the river plains regions of Obrigheim and Colgenstein, Bavaria, O. BAUER and J. WEIGERT (*Landw. Jahrb. Bayern*, 2 (1912), No. 8, pp. 545-564, figs. 2).—The soil conditions of these regions are discussed in their relation to practical soil valuation.

What the United States is doing toward the conservation and improvement of soil fertility, F. K. CAMERON (*Orig. Commun. 8. Internat. Cong. Appl. Chem.*, [Washington and New York], 26 (1912), Sects. VIa-XIb, App., pp. 699-706).—This is a brief review of progress in this country in soil surveying and in investigations relating to soil physics, soil solution, composition and biological properties of the soil, effects of rotations and fertilizers, and the adaptation and use of soils.

Report on cooperative fertilizer and variety tests, Zealand, 1912, O. H. LARSEN (*Ber. Landbofor. Virks. Plantcarl. Sjælland*, 1912, pp. 450, figs. 16).—The report describes, and gives detailed results obtained in, cooperative experimental work during the year by members of the Zealand County Agricultural Society. The trials included 512 different series of fertilizer, liming, and field tests with the ordinary agricultural crops of Denmark. Of this number 57 series were rejected for various causes. The following fertilizer trials are of more general interest:

Comparison of nitrogenous fertilizers.—The trials were conducted on different kinds of soils with small grains, mangels, ruta-bagas, and potatoes during the seasons 1907-1912, the effects of corresponding quantities of sodium nitrate, Norway nitrate, calcium cyanamid, and ammonium sulphate being studied. Placing the yields obtained by sodium nitrate over and above those on the control plats (no fertilizer) at 100, those obtained with the other nitrogenous fertilizers mentioned in the case of the different crops experimented with were as shown in the table following:

Relative increase in yields from Norway nitrate, cyanamid, and ammonium sulphate. (Sodium nitrate=100.)

Crop.	Norway nitrate.			Cyanamid.			Ammonium sulphate.		
	Number of trials.	Number of years.	Relative increase.	Number of trials.	Number of years.	Relative increase.	Number of trials.	Number of years.	Relative increase.
Rye.....	7	1	112	2	2	40	3	2	83
Wheat.....				1	1	82	2	2	81
Barley.....	6	2	101	12	4	47	11	3	78
Oats.....	4	1	118	7	3	62	5	2	85
Mangels.....	37	4	83	9	4	56	7	3	70
Sugar beets.....	7	3	83	5	2	53			
Ruta-bagas.....	15	2	117	5	2	64	5	2	72
Potatoes.....				3	1	57	3	1	83

Comparisons of 37 per cent potash salt and kainit, and of different time of application of these salts.—Twenty series of trials were conducted during 1911-12 on clay, loam, or humus soils, in which similar amounts of potash in 37 per cent salt and in kainit were applied either in the fall or in the spring. The results obtained suggest that the two fertilizers were of equal value for spring grains and sugar beets when the potash was applied in the fall. For mangels the kainit proved slightly more effective than the 37 per cent salt, while for ruta-bagas and turnips it proved somewhat inferior, and for potatoes considerably inferior, to this salt. The effect of 37 per cent salt with spring grains, mangels, ruta-bagas, and turnips was similar whether applied in the late fall (November and December) or the early spring, while with sugar beets and potatoes fall applications proved considerably more effective. The fertilizer value of kainit was the same for fall and spring applications in the case of sugar beets and mangels. For spring grains the applications of kainit in the spring proved more effective than fall applications, while the opposite held true with ruta-bagas. In the case of potatoes a very considerable difference was observed in favor of fall applications of kainit.

Factors relating to the availability of nitrogenous plant foods, J. G. LIPMAN ET AL. (*Abs. in Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 26 (1912), Sects. VIa-XIb, App., pp. 151-154*).—This is a brief account of investigations more fully reported elsewhere (*E. S. R.*, 28, p. 725).

The world's consumption of nitrogen, 1911-12, A. BERTRAND (*Engrais*, 28 (1913), Nos. 11, pp. 293-301, figs. 7; 12, pp. 322-325, fig. 1).—The production and consumption of nitrogen in form of sodium nitrate, ammonium sulphate, calcium cyanamid, and calcium nitrate are discussed in detail and illustrated graphically.

Oxidation of atmospheric nitrogen and development of resulting industries in Norway, S. EYDE (*Trans. and Organ. 8. Internat. Cong. Appl. Chem. [Washington and New York], 28 (1912), pp. 169-181, pls. 13*).—This address has already been noted from other sources (*E. S. R.*, 28, p. 221).

The Norwegian nitrate industry, S. EYDE (*Umschau*, 17 (1913), No. 13, pp. 255-260, figs. 6).—This article briefly describes plants which have been established for the manufacture of nitrogen compounds by the Birkeland and Eyde process at Notodden and the Schönherr process at Rjukan, Norway.

Experiments on the method of applying sodium nitrate, A. DEMOLON and G. BROUET (*Sta. Agron. Aisne Bul.*, 1912, pp. 26-32, fig. 1).—Applying the results of previous investigations on the diffusion of nitrate in the soil (*E. S. R.*, 27, p. 420), the author studied the direct and after effects of nitrate of soda ap-

plied at different depths. The best results were obtained by shallow application in the case of wheat and by deep application in the case of beets. There was considerable after effect of the nitrate the second year, showing that it had not entirely been carried beyond the reach of the roots of the plants by leaching.

Synthetic ammonia, H. A. BERNTHSEN (*Trans. and Organ. 8. Internat. Cong. Appl. Chem. [Washington and New York], 28 (1912), pp. 182-201*).—This address has already been noted from other sources (*E. S. R.*, 28, p. 222).

A study of the composition, toxicity, and chemical and biological evolution of crude ammonia, A. DEMOLON (*Ann. Sci. Agron.*, 4. ser., 2 (1913), 1, No. 3, pp. 178-214).—A briefer account of the investigations reported in this article has already been noted (*E. S. R.*, 25, p. 121).

The fixation of ammoniacal nitrogen by permutite and clay soils and the assimilation of permutite nitrogen by plants, D. J. HISSINK (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands], 1913, No. 13, pp. 1-60, pl. 1, figs. 5*).—In comparative tests of ammonium sulphate and ammonium permutite in pot experiments with oats grown in sand, it was found that under normal conditions with optimal water supply the nitrogen of these two substances was assimilated at about the same rate, but that with a deficiency of moisture the nitrogen of the ammonium permutite was so firmly fixed as to greatly reduce its availability as plant food. It was further noted that the percentage utilization of nitrogen decreased but the percentage of nitrogen in the plant increased with increased applications of nitrogen. Digestion in water saturated with carbon dioxide according to Mitscherlich's method furnished no indication of the availability of the nitrogen of the ammonium permutite.

Cyanamid, dicyandiamid, and lime nitrogen, J. C. DE RIJSTER DE WILDT and A. D. BERKHOUT (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands], 1913, No. 13, pp. 61-127, figs. 3*).—This article, which is a continuation of previous reports of investigations on this subject (*E. S. R.*, 20, p. 623), discusses the methods of preparation and analysis of cyanamid, and reports in detail a chemical study of the substance and its transformation products.

It was found that cyanamid 98.1 per cent pure was 94.1 per cent pure after standing 2 years. A 0.25 per cent solution of cyanamid was stable, but a 1 per cent solution underwent some decomposition, which was increased by exposure to sunlight and raising the temperature (40 to 60° C.). There was some decomposition in drying a 2 per cent solution of cyanamid over sulphuric acid, and in boiling under a reflux condenser for 40 minutes. When dried on a water bath the cyanamid was completely transformed to dicyandiamid. There was no change when a dilute solution of cyanamid was mixed with neutral solutions of various salts of corresponding strength; there was formation of dicyandiamid when mixed with alkaline salts. Acids and alkalis produced decomposition, as did storage in a moist atmosphere. Carbon dioxide was apparently without effect. There was some loss of nitrogen in all cases where cyanamid was mixed with water, potash-magnesia sulphate, kainit, and superphosphate, the greatest with water, the least with superphosphate during the first 2 months. After that time the loss with this mixture was very rapid, and at the end of 1½ years the loss was greater than in case of the mixture with potash salts.

Comparative fertilizer tests of fresh and old (partially decomposed) lime nitrogen gave results very unfavorable to the latter.

The Serpek process for the manufacture of aluminium nitrid, J. W. RICHARDS (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 4, pp. 335-337, fig. 1).—This process, as described in United States patents, is briefly described.

It is stated that the method is being tested on a large experimental scale in France.

On the method of producing bicalcic phosphate with the help of electrolytically produced acid and alkali, W. PALMAER (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 26 (1912), Sects. VIa-XIb, App., pp. 541-551; Trans. Amer. Electrochem. Soc., 22 (1912), pp. 435-444; Amer. Fert., 38 (1913), No. 11, pp. 41-45*).—The so-called Palmaer process of producing bicalcium phosphate by the action of acid and alkali, electrolytically produced from sodium chlorate or perchlorate, on tricalcium phosphate is described, and the value of the product as a fertilizer is briefly discussed.

The phosphate deposits of continental North America, L. P. BROWN (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 26 (1912), Sects. VIa-XIb, App., pp. 87-113*).—The extent, character, and relative commercial importance of these deposits are discussed. It is stated "that since the beginning of phosphate mining in this country on a commercial scale in 1867, there have been mined according to the U. S. Geological Survey 39,640,810 tons of rock, valued at \$162,329,000. Of this total South Carolina mining since 1867 has produced 11,200,074 tons, Florida mining since 1888 has produced 20,371,290 tons, and Tennessee mining since 1894 has produced 6483,983 tons."

Potash from seaweed in Mexico (*Jour. Indus. and Engin. Chem., 5 (1913), No. 4, p. 338*).—Reference is made to a concession to a company to collect and utilize for the manufacture of potash the kelp found floating along the western coast of Mexico, the principal manufacturing plant to be at San Diego. Reference is also made to a company formed in Los Angeles, Cal., to manufacture potash and other products from kelp.

[Production of potash salts and other fertilizers in Germany in 1912] (*Chem. Ztg., 37 (1913), No. 12, p. 127; abs. in Jour. Indus. and Engin. Chem., 5 (1913), No. 4, p. 338*).—It is stated that the sales of potash salts in 1912 amounted to \$42,142,857, as against \$38,819,047 in 1911. The exports of potash salts from the German Empire for 1912 were as follows:

Exports of potash salts from the German Empire in 1912.

Kind of salts.	Total.	To United States.
	<i>Metric tons.</i>	<i>Metric tons.</i>
Crude salts.....	1,300,559	650,297
Potassium chlorid.....	286,528	190,775
Potassium sulphate.....	85,452	35,366
Potassium-magnesium sulphates.....	48,540	14,172
Total exportations.....	1,721,079	890,610

The total German import of other fertilizers in 1912 was 519,246 metric tons, the export 969,715 tons.

How lime is distributed through and lost from soils, L. B. BROUGHTON (*Maryland Sta. Bul. 166, pp. 285-326, figs. 2*).—Continuing previous work (E. S. R., 18, p. 718) commercial and chemically pure calcium oxid, ground limestone, ground oyster shells, gypsum, calcium phosphate, magnesium carbonate, and barium hydrate were mixed with sand, clay, and loam soils in large stone-ware pots provided with arrangements for collecting the drainage water. One series of the pots was kept in a greenhouse and supplied with an amount of water equal to the average rainfall during the past 9 years at the station, 38.83 in. Another series was exposed to the natural weather conditions in the

open. A third series was treated with water saturated with carbon dioxide. The more important results obtained are summarized as follows:

"Different substances have very different rates of diffusion and in consideration of the salts used in this investigation the most diffusible salt of any is calcium sulphate, magnesium carbonate is considerably less diffusible than calcium sulphate, calcium carbonate is less diffusible than magnesium carbonate, calcium oxide is but little less diffusible than calcium carbonate, calcium phosphate less than either the carbonate or oxide, and barium hydrate considerably less than either of the six salts studied.

"The rapidity of diffusion depends on the difference in the concentration of the salts, the greater the difference the more marked the effect will be.

"Diffusion is considerably influenced by temperature, and becomes more rapid in respect to some salts as the temperature rises.

"Of the three soils used, salts diffuse most rapidly through the sand soil, less rapidly through the loam soil, and only to a slight extent through the clay soil.

"The movements of salts in a soil are to a large extent governed by the physical constitution of the soil, the soil having the coarser particles allowing the salts to diffuse more rapidly than the soil with many small particles.

"The amount of lime removed from the soil by the drainage water is the greatest source of loss of lime to the soil, and the extent of this loss depends entirely on the kind of lime added to the soil and the kind of soil limed.

"The carbonic acid in a soil plays no insignificant part on the influence of diffusion of lime in the soil, checking the movement of calcium oxide by forming insoluble carbonates, and forming more soluble salts with the insoluble forms as calcium phosphate, carbonate, sulphate, and magnesium carbonate.

"The amount of lime removed from the soil by the crop is in the most part very small, yet it is one of the principal means by which lime is taken from the land. In considering the exhaustion of the soil by the crop it is readily seen that exhaustion by this means is in no way so great as is suffered by depletion."

The rôle of the infinitely small in agriculture, G. BERTRAND (*Trans. and Organ. 8. Internat. Cong. Appl. Chem. [Washington and New York], 28 (1912), pp. 30-49*).—This is the original address (in French) on this subject, which has already been noted from other sources (E. S. R., 28, p. 125).

Fertilizing value of certain industrial wastes (*Sta. Agron. Aisne Bul., 1912, pp. 16-25*).—This article reports analyses and briefly discusses the fertilizing value of wool, leather and tannery, tallow and wax, starch and sugar factory, and jute wastes, horn, dried blood, marc, hog bristles, clippings from rabbit skins, bat and bird guanos, pigeon manure, dried wine lees, bone, meat, poudrette, soot, garbage, mud, and pyritic cinder.

The waste liquors from the sulphite-cellulose industry and their use in agriculture, A. STUTZER (*Fühling's Landw. Ztg., 62 (1913), No. 4, pp. 139-146*).—Investigations by others on this subject, especially Nitsche (E. S. R., 28, p. 222), are referred to.

Experiments made under the author's direction showed that neutral calcium sulphite (which occurs in sulphite liquors) was not injurious to plants on loam or sandy soils, but was injurious on moor soils. Field experiments with potatoes and pot experiments with mustard to which dried sulphite-cellulose extract was applied indicated that this material may perhaps be used with advantage on soils poor in humus and nitrogen. From a hygienic standpoint it is very desirable to find some such use for these liquors and thus prevent their discharge into the water courses.

New mineral fertilizer, C. D. WOODS (*Maine Sta. Bul. 209, pp. 12*).—This bulletin reports an experiment in which corn and potatoes were grown without

fertilizer; with ordinary commercial fertilizer containing 4 per cent of nitrogen, 8 per cent of phosphoric acid, and 7 per cent of potash (with and without addition of manure); and with so-called mineral fertilizer, which is stated to be ground rock containing no nitrogen and only traces of phosphoric acid and potash. The yields were smaller with the rock fertilizer than on the unfertilized plat.

AGRICULTURAL BOTANY.

The effects of artificial shading on plant growth in Louisiana, H. L. SHANTZ (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 279, pp. 31, pls. 6, figs. 11*).—The author gives a description of experiments conducted at Baton Rouge, La., during April and May, 1908, in which an attempt was made to determine the effect of different degrees of shade giving a definite series of light intensities on plant growth, and also to ascertain to what extent the so-called shade effects were independent of the resulting changes in other physical factors such as temperature and humidity.

Radishes, lettuce, potatoes, cotton, corn, and mustard plants were grown under six different degrees of light intensity, and it was found that where the illumination was so decreased as to range from $n/2$ to $n/7$ a general increase in growth resulted in potato, cotton, lettuce, and radish, as indicated by increased green weight, height, and number of nodes. Corn made its best growth in full light. Where the light was reduced to $n/15$ or less none of the plants were found able to elaborate food material sufficient to produce growth after the seedling stage was passed.

In estimating the solar energy received during any considerable period of the experiment, it was determined to be approximately 150 calories per square meter per second, according to Abbot's measurements. Growth was best when the energy received varied from 21 to 75 calories per square meter per second, while photosynthesis practically ceased when the energy was reduced to 10 calories per square meter per second or less. The apparent tolerance of shade exhibited by the younger plants is believed to be due to the food supply still remaining in the seed and not to any special ability of seedlings to carry on photosynthesis in weak light.

The effects of variations in temperature and humidity incident to shade were so slight that they could not be detected by a comparison of the plants in the bed in which these conditions were equalized by the use of an electric fan with the plants grown in beds where no such conditions existed. Shade produced such marked effects on plant growth that the effects of changes in humidity and temperature were considered practically negligible.

The effects of ultraviolet rays on vegetation, J. STOKLASA ET AL. (*Biol. Listy [Bohemia], 1912, p. 81; abs. in Bot. Centbl., 122 (1913), No. 4, p. 90*).—The authors describe further experiments (*E. S. R., 28, p. 529*) with the mercury vapor lamp, investigating the influence of the dark rays on etiolated plantlets of *Acer platanoides*, *Betula alba*, *Prunus cerasus*, *Syringa vulgaris*, *Aesculus hippocastanum*, *Primula obconica*, *Begonia semperflorens*, *Aloë vera*, *Tradescantia virginica*, etc.

In from one to two hours with the employment of a protective globe the plants began to show a deepening green color. The rays did not alter the chlorophyll of green plants, but the leaves became a deep green and finally the protoplasm was killed. Experiments with *Azotobacter chroococcum* are said to have shown that only the shorter ultraviolet rays kill the protoplasm. These investigations are considered to show also the probable course of assimilation.

A preliminary note on the coagulation of proteins by ultraviolet light, W. T. BOVIE (*Science, n. ser., 37 (1913), No. 940, pp. 24, 25*).—In order to gain

insight into the action of ultraviolet light on living cells, it was considered necessary to study its effect on certain constituents of protoplasm, and attention was first given to the proteids. A series of experiments were made at the laboratory of plant physiology at Harvard University with egg white, egg albumin, and ox serum placed in quartz tubes and exposed at room temperature to the light of a quartz mercury vapor lamp.

The coagulum produced by the light in egg white and egg albumin was insoluble in alcohol, hot or cold water, and dilute acids, but was soluble in dilute alkalis. In these respects it agrees with the ordinary coagulum produced by heat without exposure to ultraviolet light.

The temperature coefficient of the coagulation caused by ultraviolet light, W. T. BOYD (*Science, n. ser.*, 37 (1913), No. 949, pp. 373-375).—In a previous paper (see above) the coagulation of proteids when exposed to ultraviolet light was shown, and the author has carried on experiments to determine the nature of the reaction, particularly its temperature coefficient. Crystallized egg albumin in quartz test tubes was exposed to the light of a quartz mercury vapor lamp and the coagulation estimated by measuring the amount of deposit in the test tubes after centrifuging.

When the tubes were kept at 0° C. they remained clear after having been exposed to the light for 35 hours, while those exposed at a higher temperature contained coagulum. When the tubes which had been exposed at 0° were warmed their contents began to coagulate, and it was apparent that at least two reactions took place, first, the change produced by light, and, second, the production of a visible coagulum. It appeared that the action of the light was about the same at the different temperatures, but that the substance at 0° was unable to produce any visible coagulation.

This experiment is believed to offer an interpretation of the results of Blackman and Matthaei (*E. S. R.*, 17, p. 234) regarding the effect of temperature on the process of photosynthesis.

The principal results of the experiments are summarized, the author stating that two reactions are involved in the coagulation of proteids by light, the chemical change and the production of a visible coagulum. The light reaction has a very low temperature coefficient, while the reaction producing the visible coagulum has a much higher temperature coefficient.

Forcing plants with radium, H. MOLISCH (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl.*, 121 (1912), I, No. 3, pp. 121-139, pls. 2).—The substance of this article has already been noted from another source (*E. S. R.*, 28, p. 228).

The influence of thorium X on sprouting plants, F. KAHN (*München. Med. Wchnschr.*, 60 (1913), No. 9, pp. 454, 455, figs. 6).—As a result of a study with oats and cress, the author claims to have found that, while the effects observed may vary considerably with different experiments and different stages, exposure to smaller quantities of thorium X appeared generally to favor, while larger quantities retarded, the germination of seeds and the growth of plants.

Recovery from hail wounds on woody plants, E. VOGES (*Centbl. Bakt. [etc.]*, 2. Abt., 36 (1913), No. 19-25, pp. 532-567, figs. 11).—This is a detailed study of the cicatrization of fruits, the formation of protective structures in bark, the peculiarities of parenchyma and sclerenchyma in renewed cortex, the effects upon woody and other structures, etc., as observed 6 months after widespread hail injury to various cultivated plants in northwest Germany.

Toxicity of smoke, L. J. KNIGHT and W. CROCKER (*Abs. in Science, n. ser.*, 37 (1913), No. 949, p. 380).—Attention is called to publications of Molisch (*E. S. R.*, 27, p. 830) which indicate the extreme toxicity of tobacco smoke to various plants. This toxicity has been found not to be due to volatilized nicotine, but is believed to be due to carbon monoxide.

According to the authors, in the burning of organic compounds the destructive distillation carbon-bearing gases, CO , C_2H_2 , C_2H_4 , and CH_4 , are not generally completely burned and may be the source of injury in the smoke. Experiments with sweet pea seedlings show that smoke from cigarettes, cigars, and cellulose paper does not contain sufficient CO , C_2H_2 , or CH_4 to amount to 1/200 of the toxicity of the smoke. This leaves C_2H_4 as the substance probably determining the toxicity.

The injury from smoke in cities is usually attributed to sulphur dioxide and sulphur trioxide, so far as gases are concerned. The authors claim that the possible effect of the dry distillation of carbon-bearing gases has been neglected, and that on account of their extreme toxicity they are probable factors in the smoke question.

A delicate test seedling, W. CROCKER, L. J. KNIGHT, and R. C. ROSE (*Abs. in Science, n. ser.*, 37 (1913), No. 949, pp. 380, 381).—The investigations of the authors have shown that ethylene gas produces with sweet pea seedlings what is termed a triple response, marked by a reduction in the rate of elongation, increased growth in diameter, and diageotropism. The effect of some 50 or more gases and vapors upon the seedlings has been studied, and the seedlings found apparently reliable and extremely delicate in testing for ethylene, being from 2,000 to 5,000 times as delicate as gas analysis methods. While other gases give the triple response, they must be present in such quantities as to be easily detected by other means.

Formaldehyde in the sap of green plants, F. ANGELICO and G. CATALANO (*Gaz. Chim. Ital.*, 43 (1913), I. No. 1, pp. 38-43).—Experiments bearing upon the hypothesis that formaldehyde is formed in light directly from carbon dioxide and water were carried out with the leaf sap of *Lupinus albus*, *Securigera coronilla*, *Lathyrus gorgonia*, *Mirabilis jalapa*, *Dolichos albiflorus*, *Lavatera alba*, *Helianthus annuus*, *Akebia quinata*, *Zea mays*, *Mesembryanthemum cordifolium*, and *Tropaeolum majus*, all of which after normal illumination gave positive response to tests for formaldehyde. The first six of these, after having been kept for 24 hours in darkness, gave negative reactions, as did also *Psalliotia campestris*, *Clitocybe* sp., and *Coprinus* sp. It is held to have been shown that the formation of formaldehyde in green cells depends upon the factors chlorophyll and light, and that it bears an intimate relation to photosynthesis.

Conditions affecting the development of lycopin in the tomato, B. M. DUGGAR (*Abs. in Science, n. ser.*, 37 (1913), No. 949, p. 378).—The author states that both lycopin and carotin occur in the ripening of the tomato. An experimental study of the effects of various conditions upon ripening demonstrated that while carotin is developed under conditions of growth differing quite widely, lycopin is formed only within a limited range of metabolic activity. Temperature and oxygen supply are two of the factors indirectly limiting lycopin development. In yellow varieties of the tomato carotin only is found, while in the red varieties the formation of lycopin is precluded by high temperatures, yellow fruits resulting. Irreversible effects are not produced by heat. Red tomatoes are believed to contain a factor for redness superimposed upon the factor or factors for yellow, and this conclusion is borne out by breeding experiments.

The regulatory formation of tannase in *Aspergillus niger* and *Penicillium* sp., L. KNUDSON (*Abs. in Science, n. ser.*, 37 (1913), No. 949, p. 378).—The investigations of the author have shown that *A. niger*, *P. rugulosum*, and *Penicillium* sp. can ferment tannic acid, gallic acid resulting. Experiments were conducted by him with 14 organic compounds used as sources of carbon, but only when the source of carbon was tannic acid, gallic acid, or cane sugar supplemented by gallic or tannic acids were the organisms able to form tannase. Gallic acid was not as efficient as tannic acid in stimulating the production of the

enzym. Where the source of carbon was 10 per cent sugar supplemented by tannic acid in variable quantities, it was found that the greater the concentration of the tannic acid present the greater was the quantity of the enzym produced. The greatest amount of tannase was formed where tannic acid was the sole source of carbon.

Microchemical study of hydrocyanic acid in *Prunus laurocerasus*, K. PECHE (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl., 121 (1912), I, No. 1-3, pp. 33-55, pl. 1, fig. 1*).—The author gives the results of investigations on cherry laurel.

It is stated that hydrocyanic acid was clearly localized in leaf parenchyma, and that a connection with previous illumination was established. Its location suggests that it may have its origin in connection with the chlorophyll bodies of the palisade cells, where it was found in close relation with cells containing tannic acid. It was found also in other parts and some knowledge was gained as to its movements and compounds in the plant.

A brief bibliography is appended.

The assimilation of free nitrogen by *Azolla*, A. OES (*Ztschr. Bot., 5 (1913), No. 3, pp. 145-163, fig. 1*).—The author reports concerning a study of *Azolla* in various nutritive media since 1909, stating that this plant thrives very well in media containing no supply of nitrogen; that in this case a decrease in percentage of nitrogen in the dry substance is noted, although there is an absolute increase of nitrogen; and that *Azolla* is able to appropriate free nitrogen from the atmosphere, apparently by means of a blue-green alga (*Anabaena*), living in symbiosis with it.

The synthesis of amids which depends on ammonia absorbed through the roots, D. PRIANICHNIKOV (*Rev. Gén. Bot., 25 (1913), No. 289, pp. 5-13*).—A study has been made of a number of kinds of plants to determine the possibility of their utilizing dilute solutions of ammonium salts and transforming the nitrogen into other compounds.

It was found that those plants which readily absorb ammonium chlorid or ammonium sulphate, such as barley, maize, and pumpkins, form asparagin, or glutamin, from the nitrogen obtained. Others, such as peas, which do not absorb ammonium salts so readily or which require the addition of calcium carbonate to produce a rapid assimilation of ammonia, are able to form asparagin. Lupines are unable to make use of ammonium salts for the synthesis of other nitrogenous material, even with the addition of calcium carbonate.

Observations on a fungus living on fatty hydrocarbons, G. GOLÀ (*Bul. Soc. Bot. Ital., 1912, No. 8, pp. 224-227*).—This is a preliminary report of a study on the behavior of fungi which are able to live on fatty hydrocarbons.

It is said that the development of the fungi was most favorable on purified vaseline, but much less so on liquid hydrocarbons. Some results seemed to favor the hypothesis of a secretion by the fungus preceding the process of absorption, but other considerations suggested caution pending further investigations.

Preliminary report on the relation of bacteria, yeasts, and mold fungi to iodine compounds, A. KOSSOWICZ and W. LOEW (*Ztschr. Gärungsphysiol., 2 (1913), No. 3, p. 158*).—It is stated that no iodine was separated from potassium iodid during experiments with several yeasts, or with most of the mold fungi investigated. *Aspergillus niger* and *Penicillium glaucum* separated considerable iodine, as did also several bacteria examined, and *Cladosporium herbarum* after a time.

Studies of osmotic pressure, M. A. BRANNON (*Abs. in Science, n. ser., 37 (1913), No. 949, p. 379*).—An account is given of studies on osmotic pressure made by cryoscopic methods, the Beckmann apparatus being employed to deter-

mine the freezing points of the solutions used. Different kinds of potatoes were selected and placed in controlled conditions so that heat should be the only limiting factor of the experiments. One collection was placed in an ice box where a temperature of 2° C. was maintained, while another was kept at a temperature of 25°.

At the beginning of the experiments the osmotic pressure of the different potatoes was about 7 atmospheres. After 10 months in the ice box there developed a maximum osmotic pressure of 13 atmospheres. The lower temperature favored metabolic activities resulting in the liberation of an acid, a catalyte, and the fermentation of foods, stored in the form of starch and hemicellulose. The change from colloids to crystalloids was accompanied by a rise in osmotic pressure.

The fermentation of the hemicellulose was indicated by a reduction in the thickness in the cell walls of the potato tissue affected, and also by an increase in the brittleness of the tissues.

These studies are believed to be suggestive of the changes taking place in the after-ripening of seeds, tubers, and bulbs, and to have a definite relation to several economic and scientific problems.

Induced variations in the osmotic pressure and sodium chlorid content of the leaves of nonhalophytes, F. J. LEWIS (*New Phytol.*, 11 (1912), No. 7, pp. 255-264; *abs. in Bot. Centbl.*, 122 (1913), No. 6, pp. 152, 153).—This is a study of the effect of sea spray on leaves by immersion of those of several species of plants in sea water and in salt solutions of corresponding strength.

All the plants showed an increase of salt in different percentages, also of osmotic pressure. In some the total increase in weight considerably exceeded that due to the salt, indicating an absorption of water. Leaf cells of all plants showed plasmolysis at first, but this disappeared in from 12 to 27 hours. The cells were living at the end of the experiments.

A study of the distribution of osmotic pressure in relation to water conduction in plants, E. HANNIG (*Ber. Deut. Bot. Gesell.*, 30 (1912), No. 4, pp. 194-204; *abs. in Bot. Centbl.*, 122 (1913), No. 4, p. 87).—This is a preliminary statement in regard to the author's investigations on osmotic pressures in 64 plants, representing widely different conditions in regard to moisture.

The results obtained are said to be somewhat at variance with the view ascribed to Fitting (E. S. R., 25, p. 430) that high osmotic pressure in leaves is associated with equal pressure in the roots. The author found the osmotic pressure in the roots to be less in all but a few cases and very much less in some, as in *Plantago*, where it is just about one-half that in the leaves.

Protoplasmic contractions resembling plasmolysis which are caused by pure distilled water, W. J. V. OSTERHOUT (*Abs. in Science*, n. ser., 37 (1913), No. 949, p. 379).—The author describes a form of plasmolysis, designated as false plasmolysis, which is caused in the root tips of *Zostera marina* when placed in distilled water. This condition resembles greatly that of true plasmolysis produced by hypertonic sea water or hypertonic sugar solutions.

A chemical and physiological study of after-ripening of the Rosaceæ, SOPHIA ECKERSON (*Abs. in Science*, n. ser., 37 (1913), No. 949, pp. 378, 379).—The author states that the hawthorn is one of the few seeds in which there is known to be a dormancy of the embryo and that a period of after-ripening is necessary before germination is possible. The food stored in the embryo is said to be a fatty oil, neither starch nor sugar being present. The reaction of the cotyledons is acid, but that of the hypocotyl is slightly basic.

During the period of after-ripening a series of metabolic changes take place in the embryo. The initial change seems to be an increase of acidity correlated with an increase in water-holding power and an increase in the activity of

catalase and peroxidase. Near the end of the period of after-ripening there is a sudden greater increase in acidity and in the water content. At this time the fats decrease and sugars appear.

The after-ripening period, it was found, can be shortened greatly by treating the embryos with dilute solutions of hydrochloric, butyric, and acetic acids. The water-holding power, the acidity, and the activity of peroxidase increase much more rapidly than in the untreated embryos.

The relation of ventilation to the respiration of fruits, G. R. HILL, JR. (*Abs. in Science, n. ser.*, 37 (1913), No. 949, p. 378).—A study is reported of the respiration and other metabolic phenomena of cherries, blackberries, green, market ripe, and very ripe peaches, ripe red Astrachan apples, and Concord and Catawba grapes which were placed in nitrogen, hydrogen, air, and carbon dioxid. Particular attention was given to an investigation of the common cold storage injury known as ice scald, and the results point quite definitely to a close relationship between it and anaerobic respiration. The keeping qualities of fruits in storage in the gases and the relation of these to ventilation were also considered.

Comparative investigations on the transpiration of barley with and without awns, E. W. SCHULZE (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien*, 1 (1913), No. 3, pp. 285–308, pls. 3).—Barley plants having awns transpired much more than those naturally or artificially awnless, the slight elevation of transpiration shown by the last being attributed to wounding and loss of water. Direct insolation raised considerably the relative rate of the naturally awnless variety as compared with its effect on the other two. The highest point of transpiration was reached when in the milk stage of the grain.

The heat of absorption of water in wood, F. DUNLAP (*Abs. in Science, n. ser.*, 37 (1913), No. 949, p. 381).—Studies were made of oven dry wood to determine the heat evolved when brought in contact with water. The wood and water were both cooled to 0° C., brought together at this temperature, and the heat evolved was measured. This was found to raise the dry wood entering into the reaction from 0 to about 50°. Assuming that the specific heat of wet wood is the sum of the specific heats of the wood and water present in wet wood, the author claims that its temperature would be raised to about 30°. He states that wood is hygroscopic and that its moisture content varies with that of the atmosphere about it. The "working" of wood is due to changes of volume of its substance with changing moisture content, and experiments are in progress to destroy the hygroscopicity of wood or render it insensitive to changes in the atmosphere.

Studies of the wild oat, W. M. ATWOOD (*Abs. in Science, n. ser.*, 37 (1913), No. 949, p. 380).—A study was made of the germinative quality of *Avena fatua*.

It was found that the seed germinates poorly after harvest, but that the percentage of germination increases steadily up to the succeeding spring and summer. The delay in germination appears to be due neither to the chemical condition of the embryo nor to the obstruction offered to water entry by the seed coats. Oxygen seemed to be the limiting factor to germination, and breaking the seed coats or increasing the oxygen pressure stimulated the germination. Investigations are in progress to determine whether the so-called after-ripening of the seed is due to alterations in the oxygen demands or to increased permeability of the seed coats.

The problem of the origin of *Oenothera lamarckiana*, B. M. DAVIS (*Abs. in Science, n. ser.*, 37 (1913), No. 949, p. 376).—According to the author *O. lamarckiana* has been identified as a form of *O. grandiflora*, and this has materially changed the situation in respect to the origin of the plant which has been the subject of experimentation by De Vries. It is claimed that *O. lamarckiana* is

not known as a native species in any part of the world and that there is reason for believing that the plant has come down to us as a hybrid and a product of a long period of cultivation.

The variability of *Bacillus solanacearum*, J. A. HONING (*Meded. Deli Proefstat. Medan*, 7 (1912), No. 5, pp. 196-208; *Centbl. Bakt. [etc.]*, 2. Aft., 36 (1913), No. 19-25, pp. 491-499).—The author, finding *B. solanacearum* very variable in its characters, experimented with a great number of cultures in various nutritive media.

As a result, it is stated that with a large number of different carbon and nitrogen sources this fungus showed development only in a part of the cultures employed. Differences of alkalinity exert little, and those of light and temperature no, influence on the variability. Only a few individuals among many thousands are able to adapt themselves to new substrata, and the acquired modifications are not sufficiently constant to rank as mutations. It is stated also that in a few instances *Bacterium delicuse* n. sp. has shown the same tendency to vary.

Constant variants of *Capsella*, H. HUS (*Abs. in Science*, n. ser., 37 (1913), No. 949, p. 375).—In the investigations of the author pedigree cultures from *Capsella* showed the existence of a number of constant forms that have not previously been reported, some of which are not identical with the biotypes described by Shull. Emphasis is laid by the author on the importance of the study of seedling stages in the identification of these forms.

Preliminary note on the inheritance of self-sterility in *Beseda odorata*, R. H. COMPTON (*Proc. Cambridge Phil. Soc.*, 17 (1912), No. 1, p. 7).—A brief summary is given of the author's investigations relating to the self-sterility of mignonette, some forms of which are believed to be self-sterile while others are completely self-fertile. Seed was obtained from various sources and plants grown, and the observations on the first generation are given, which seem to confirm the hypothesis regarding sterility.

Self-sterile plants when bred among themselves gave self-sterile offspring only, indicating that self-sterility is recessive, according to the Mendelian theory. Some of the self-fertile plants when self-fertilized yielded self-fertile offspring, and the same result was obtained when crossed with self-sterile plants. These are regarded as homozygous. Other self-fertile plants when self-fertilized yielded approximately three self-fertile to one self-sterile offspring. When crossed with self-fertile plants about half the progeny were self-fertile, the other half being self-sterile.

Other characters were noted in the study, and it appears that tall and dwarf races exist in mignonette and that the F_1 between them is intermediate in height. Differences in pollen were observed, the orange red color appearing to be a simple dominant to bright yellow and self-fertilized heterozygotes yielding about three reds to one yellow.

Some relations between root characters, ground water, and species distribution, W. A. CANNON (*Science*, n. ser., 37 (1913), No. 950, pp. 420-423).—The author reports observations on the root habits of desert shrubs and trees, discussing the relations between the root habit, the ground water, and species distribution.

He claims that there is an intimate relation between the occurrence of certain species of trees and the character of their roots with regard to the depth at which perennial water may be found. Among the illustrations cited he states that the mesquite, which is the most widely distributed tree of the Tucson region, occurring not only on the flood plains of streams but also at higher elevations, assumes a tree form only where the roots can reach to the water table. Elsewhere the character of the plant is that of a shrub. From a com-

parison of the distribution of the mesquite with maps showing the water table depths it appears that this species becomes a tree only where the ground water does not lie deeper than 50 ft.

Other observations are given on tree distribution as related to the depth of perennial water in regions outside of southern Arizona.

FIELD CROPS.

Second annual report of Paulding County experiment farm, C. MCINTIRE (*Ohio Sta. Bul.* 258, pp. 287-298).—This bulletin reports crop rotation and fertilizer tests, chiefly in tabulated form.

In a sugar beet, oats, and clover rotation fertilizers were applied to the beet crop, the largest yield being 13.975 tons per acre, produced with an application of 10 tons barnyard manure and 300 lbs. acid phosphate. This crop contained 13.6 per cent sugar, with the percentage of purity 84.8. In a cereal rotation with corn, oats, wheat, and clover the largest yield of corn was 70 bu. per acre, produced with the use of 200 lbs. acid phosphate, but at a loss of 9 cts. per acre. Comparative yields which were secured at the main station at Wooster are also presented.

In a rotation of corn, soy beans, wheat, and clover in which the fertilizers were applied to the soy beans, the largest yield of this crop was 22.25 bu. per acre, produced with an application of 200 lbs. acid phosphate and 50 lbs. muriate of potash. This crop gave a net profit of \$4.03. Variety tests of corn, oats, soy beans, and sugar beets are reported, with comparative data from the main station. Subsoiling sugar beets to a depth of 14 in. gave very little difference in yield as compared with ordinary plowing to 7 in.

The work of the Truckee-Carson experiment farm in 1912, F. B. HEADLEY (*U. S. Dept. Agr., Bur. Plant Indus. Circ.* 122, pp. 13-23, figs. 3).—Investigations have been conducted with special reference to the general lack of vegetable matter in the soil, the presence of harmful quantities of alkali salts, and the existence of a high water table due to surplus water from irrigation.

In experiments with sugar beets, while large yields were not obtained, increased yields were produced by the application of nitrate of soda, sulphate of potash, acid phosphate, and gypsum in various combinations. Fields that had previously been in alfalfa gave much greater yields of sugar beets than other lands, the former ranging from 18.9 to 25.3 tons per acre, as compared with a range of 3 to 10 tons on the latter. Sweet clover has been found to have a useful place in the crop rotations, especially in connection with alfalfa. Of 12 varieties of alfalfa in row tests, Grimm gave the highest yield, 131 lbs. per 100-ft. row, and Caucasus the second highest, 126 lbs. The yields ranged as low as zero. Trials of millet, field corn, and vegetables were made, and also co-operative experiments with potatoes, onions, and strawberries.

In alkali and ground water studies it has been found that sodium carbonate, sodium bicarbonate, and sodium chlorid were the alkali salts chiefly affecting plant growth, as shown below:

Percentage of alkali salts on an alfalfa plat, Truckee-Carson experiment farm.

Depth.	Sodium carbonate.		Sodium bicarbonate.		Sodium chlorid.		Other salts.		Total salts.	
	Good growth.	Poor growth.	Good growth.	Poor growth.	Good growth.	Poor growth.	Good growth.	Poor growth.	Good growth.	Poor growth.
<i>Inches.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>
0-8	0	0	0.082	0.027	0	0.003	0.179	0.180	0.261	0.210
8-16	0	0.029	.073	.141	0	0	.082	.305	.155	.175
16-24	0	.087	.190	.156	0	.073	.225	.166	.415	.482
24-36	0	.095	.098	.370	0	.028	.067	.159	.165	.652

Weekly determinations of the elevation of the water table showed an average depth to ground water of 4.43 ft. on April 1, 3.79 ft. on June 3, and 4.86 ft. on December 27.

Duty of water, G. H. TRUE (*Nevada Sta. Rpt. 1911, pp. 27-30*).—The irrigating of White Australian wheat 3 times before heading and twice after heading with an application of 1.41 ft. of water was followed by larger yields than any other method, viz, 45.6 bu. per acre. With 2 applications before heading and one afterward of 1.033 ft. of water there was produced 42.5 bu. per acre. Siberian oats gave the best yield, 60.8 bu. per acre, when treated with an application of 1.107 ft. of water once before heading and twice after. With alfalfa the heaviest yield of hay, 7.52 tons per acre, was produced by flooding to a depth of 5.077 ft., but with flooding to a depth of 3.051 ft. per acre there was produced 6.61 tons. Of 6 varieties of potatoes Blue Victor gave the best yield, 156.8 bu. per acre, with an application of water 4.433 ft. in depth. In a variety test of sugar beets 23.13 tons were produced per acre by No. 21857, which contained 19.8 per cent sugar in the juice and was of 87.6 per cent purity. Yields with winter wheat, barley, rye, and oats are also noted.

[Irrigation experiments and sugar beet investigations], G. H. TRUE ET AL., C. S. KNIGHT and F. L. PETERSON (*Nevada Sta. Rpt. 1912, pp. 18-22*).—This paper reports further observations (see above) on the irrigation experiments with White Australian wheat, Siberian oats, and alfalfa, variety tests with spring and winter cereals, potatoes, and corn for silage.

The results of sugar beet experiments show that continued cultivation throughout the season produced better yields than other methods tried, that the rate of seeding of 25 lbs. per acre gave larger yields than 15, 20, or 30 lbs., and that rows 16 in. wide as against 18, 20, and 24 in. produced better yields with plants 6 or 8 in. apart, and the 20-in. width better with plants 12 in. apart. The 8-in. spacing in a row produced the highest yield of all, viz, 10.92 tons per acre, with rows 16 in. wide.

Report of the substation of the Swedish Seed Association at Luleå, 1911, A. ULANDER (*Sveriges Utsädesförs. Tidskr., 22 (1912), No. 6, pp. 343-351*).—This report presents brief accounts of variety tests and breeding experiments with grasses, barley, oats, and legumes for the year at this station, located in extreme northern Sweden.

Field crop trials in Tromsø County, B. R. LARSEN (*Tidsskr. Norske Landbr., 19 (1912), No. 5, pp. 193-205*).—A report on trials with barley, hay crops, turnips, and potatoes conducted during the last decade, and especially since 1906, in the northernmost county of Norway (largely within the Arctic circle).

Cooperative experiments, E. CLIFTON (*New Zeal. Dept. Agr. Ann. Rpt., 20 (1912), pp. 87-90*).—Some of the results of the 400 cooperative experiments, involving 5,205 plats, are here reported with rape, kale, marrow cabbage, Silver beet, and wheat.

Essex Dwarf rape yielded 29.55 tons and Giant Essex Broadleaf 38.54 tons of leaves per acre, and the pasture capacity with sheep for the 2 varieties was at the rate of 223 per acre for 14 days. Thousand-headed kale yielded 23.24 tons and Green Buda kale 26.96 tons of leaves per acre, and an acre of the 2 varieties was capable of pasturing 217 sheep for 14 days. Buda kale grew again very rapidly after pasturing. Marrow cabbage yielded 30.14 tons leaves per acre, and Silver beet yielded 51.72 tons leaves per acre. These 2 latter crops have not yet been pastured.

Report on the Cawnpore Agricultural Station in the United Provinces for the year ended June 30, 1912, B. C. BURT (*Rpt. Cawnpore [India] Agr.*

Sta., 1912, pp. 42+3, pl. 1).—This report gives results of the progress of work previously noted (*E. S. R.*, 26, p. 630).

Practical crop rotation, with special reference to catch crops, W. EGGERS (*Praktische Fruchtfolgen mit Berücksichtigung des Zwischenfruchtbaues*, Berlin, 1912, 3. ed. rev., pp. 104, figs. 2).—This book discusses farming systems, with reference to intensive and extensive methods. The place of each of the following legumes in a rotation system is considered: Alsike clover, Bokhara clover, horse beans, kidney vetch, lupines, peas, white clover, sand vetch, serradella, Swedish clover, vetch, and yellow clover. Practical rotations are suggested for sandy clay, various calcareous, and swamp soils, and for meadows.

The book of grasses, MARY E. FRANCIS (*Garden City and New York*, 1912, pp. XVI+351, pls. 81, figs. 118).—This is a treatise on the grasses occurring between Canada and Virginia and westward to the Mississippi, including the most common sedges and rushes. The illustrations were made from the living plants, and are accompanied by technical and general descriptions.

Report of breeding experiments with grasses and legumes, 1911, H. WITTE (*Sveriges Utsädesför. Tidskr.*, 22 (1912), No. 6, pp. 335-342).—This report gives an account of experiments with varieties of orchard grass, timothy, tall oat grass, meadow fescue, and other grasses; red, alsike, and white clovers; and alfalfa.

An irrigation experiment, R. C. FISCHER (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien*, 1 (1912), No. 2, pp. 131-152).—This paper comprises the results of irrigation experiments with alfalfa, covering 3 seasons, 1908-1910, in which the check plat II C yielded in 1908 41.01 quintals per hectare (about 1.8 tons per acre), in 1909 58.52 quintals, and in 1910 52.32 quintals. The irrigated plats were divided into 3 series, with 3 plats in each. Plats I, II, and III were watered 8 times, plats I A, II A, and III A, 6 times, and plats I B, II B, and III B, 5 times each year in varying amounts at different periods. Plats I, II, and II B received 4,200 cubic meters of water per hectare during the vegetative period, and produced an average of 101 quintals of dry matter per hectare. Plats II A, III, and III A received 7,600 cubic meters of water per hectare during the vegetative period, and produced an average of 78.24 quintals of dry matter per hectare, while plat III B, which received no water during the vegetative period but in the fall, yielded an average of 90.16 quintals of dry matter per hectare. The general average of all irrigated plats was for the 3 years 97.55 quintals, and for unirrigated plats 50.28 quintals of dry matter per hectare, an increase of 94 per cent for the irrigated land.

During 1909, the most favorable results were obtained when the crop received 107 meters of water per 1 quintal dry matter, and the most unfavorable amount of water was 242 meters per quintal dry matter. During 1910, the best results were obtained with an application of 113 cubic meters, and the most unfavorable with 558 cubic meters per quintal dry matter.

Analyses showed that the hay crop from plat I contained 21.77 per cent of protein, 0.676 per cent of phosphoric acid, and 2.199 per cent of potash; from plat III B, 19.8 per cent of protein, 0.564 per cent of phosphoric acid, and 1.76 per cent of potash; and from plat II C (check), 19.99 per cent of protein, 0.595 per cent of phosphoric acid, and 1.579 per cent of potash.

A simple demonstration of the action of natural selection, J. A. HARRIS (*Science*, n. ser., 36 (1912), No. 934, pp. 713-715).—In discussing natural selection as a "highly speculative discipline," the author relates results of an experiment made at the Station for Experimental Evolution in 1912.

"In the spring of 1912, a series of about 238,000 bean seedlings was examined for morphological variations to serve as a basis for experiments in selection

within the 'pure line.' Of these, about 4,217 abnormal and 5,030 normal seedlings were transplanted to the field. In doing this great care was used to maintain precisely comparable conditions for both normal and abnormal plants. . . . Of the 5,030 normal plants, 226 or 4.493 per cent died. Of the 4,217 seedlings showing some morphological variation from type, 286 or 6.782 per cent failed to reach maturity."

Berseem, or Egyptian clover (*Trifolium alexandrinum*) (*Jour. Dept. Agr. So. Aust., 16 (1913), No. 6, pp. 688, 689, fig. 1*).—This paper reports 2 trials in which was produced a growth of from 15 to 24 in. in height at each of 5 cuttings during the season under irrigation. It is stated that the crop made an excellent food for poultry, cows, horses, and pigs.

A manual of clover culture, W. H. PYRE (*Waterloo, Iowa, 1913, pp. 104, figs. 39*).—In the presentation of this book the author has attempted to emphasize the value of clover as a soil improver, placing special stress upon the importance of inoculation. He also discusses general facts about clovers, clover troubles, the story of "nitragin," and clover varieties.

The management of clover in corn belt rotation, J. A. DRAKE (*Ann. Rpt. Ill. Farmers' Inst., 16 (1911), pp. 83-94, figs. 4*).—The author points out the element of uncertainty in seeding clover in early spring on light snow or honey-combed soil, and advises waiting until the late spring and putting the seed in with a harrow or disk drill to insure covering. If sown with rye the clover will be well shaded, the likelihood of success in getting a good stand will be larger than in the case of seeding with oats, and the ground can be disked and harrowed with little injury. Reference is also made to the practice of sowing in wheat in the fall and spreading straw over the field, this resulting in a good stand of clover in the spring coming up through the straw.

Factors affecting the production of long-staple cotton, O. F. COOK (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 123, pp. 3-9*).—This paper points to the fact that through the activities of this Department in the introduction of improved early varieties, the cultivation of long-staple cotton introduces a new factor into the problem of production. The author calls attention to the possibilities of a temporary overproduction of this staple, but believes that the market and manufacturing conditions will probably readjust themselves to meet the conditions and permit of a gradual development of a long-staple industry.

Egyptian cotton culture in the Southwest, C. S. SCOTFIELD (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 123, pp. 21-28, figs. 2*).—This paper reports the results of field trials with Egyptian cotton on a small scale by the farmers in the Southwest.

The yields of this variety in 1912 from Salt River Valley varied from 488 to 747 lbs. of ginned cotton per acre, and in the Imperial Valley from 396 to 555 lbs. per acre. The cost of producing an acre, estimating a yield of 1,800 lbs. of seed cotton, totaled \$61, exclusive of interest on land investment. This crop is reported as being one which fits admirably into the best rotation system for the southwestern irrigated lands. When cotton was alternated with alfalfa beneficial results were obtained from both crops.

Behavior of seed cotton in farm storage, C. J. BRAND and W. A. SHERMAN (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 123, pp. 11-20, figs. 2*).—From results of tests made at Bennettsville, S. C., in which seed cotton was left for several weeks in storage piles, loose and in tramped condition, it was found that from 43.5 to 64 per cent of the seed germinated when unaffected by heating. When the heating reached 111° F., from 5 to 13 per cent of the seeds germinated, and when the temperature reached 127 and 133°, no seeds germinated.

Data as to temperature and moisture conditions in cotton stored in various ways are also reported in tabular form.

Couch grass (*Agropyron repens*), C. KRAUS (*Arb. Deut. Landw. Gesell.*, 1912, No. 220, pp. 152, pls. 19).—This is an extensive discussion and compilation in regard to the common couch or wheat grass. The subject is treated in 7 chapters, covering (1) nomenclature and botanical description; (2) distribution and natural methods of propagation; (3) uses and disadvantages of the plant in cultivated fields and meadows, productivity and chemical composition, feeding value, and manurial value; (4) description of the plant and its parts; (5) development of the plant, and the multiplication of the rhizomes in the soil; (6) the behavior of couch grass in abnormal conditions, such as burying the rhizomes with earth, growth in wet soil, suppression of light, removal of above-ground parts, drought resistance, cold resistance, and chemical treatment; (7) methods of combating, heavy shading by crops, and seeding land to grass. It is noted that couch grass may be exterminated either by direct or indirect methods, their effectiveness depending upon the kind and time of application.

Analyses of the air-dried rhizomes showed 1.07 per cent nitrogen, 0.49 per cent potash, 0.38 per cent phosphorus, and 0.27 per cent calcium. A yield of 388 gm. of couch grass per plat is noted in comparison with 428 gm. of fescue, 713 gm. of orchard grass, 545 gm. of English rye grass, and 735 gm. of timothy.

Feterita, a new variety of sorghum, H. N. VINALL and C. R. BALL (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 122*, pp. 25-32).—This paper reports work with this new grain sorghum at Amarillo and Chillicothe, Tex., for the past 5 or 6 years. The history of its introduction from Egypt is given, with its description, probable value, and methods of planting, cultivation and harvest.

The yields of feterita ranged about like those of milo and Dwarf milo maize, and at the Amarillo station varied from 9.3 to 40.3 bu. per acre. At Lubbock, Tex., in 1912, feterita produced 57.71 bu. per acre.

As feterita is a newly introduced plant, and quite variable, it is suggested that seed selection and improvement be practiced in each district where it is grown in order to obtain adapted strains.

History of the Wurttemberg hop culture, K. NASTOLD (*Tübinger Staatswiss. Abhandl.*, 1911, No. 15, pp. 131).—The 4 main topics taken up are the history and development of hop culture in Wurttemberg from its early beginning to the present day; the hop industry in individual districts; the technique, including the varieties, hop garden plans and annual work, the wire and stake methods of cultivation, the harvest, drying, and kilns; and the profits of hop culture.

Oats by pictures, J. BROILI (*Arb. Deut. Landw. Gesell.*, 1911, No. 194, pp. 17, pls. 16).—This presents drawings, mostly greatly enlarged, of the parts of the inflorescence and kernels of oats, with brief explanations of each.

Hulled oats, Y. BUCHHOLZ (*Tidsskr. Norske Landbr.*, 19 (1912), No. 5, pp. 213-223).—The results of the author's investigations indicated that the hulled oats were only 50 per cent as valuable as whole oats as seed grain. The oats hulled in the threshing process showed a lower percentage of germination than the whole oats of the same crop. The germination of the hulled oats is also greatly reduced during storage.

Proper growing and handling of potato seed stock, C. D. WOODS and W. J. MORSE (*Maine Sta. Doc. 435*, pp. 15).—This is a paper presented at the annual convention of the American Seed Trade Association, June 21, 1911, discussing the factors which bear on the production of seed potatoes, the handling and shipping of seed, vegetative vigor, northern grown seed, seed true to name, how to improve a strain, quality of seed, and potato diseases. Quality and purity of seed are regarded as of prime importance in the production of seed potatoes.

Shallu, or Egyptian corn (*Wallaces' Farmer*, 38 (1913), No. 12, p. 527).—This article notes a yield of over 70 bu. per acre of this grain, obtained by a

Nebraska farmer in 1911 in a dry season. It is stated to have been greatly relished by chickens and seemed to be equal to corn for hogs.

Soy beans and secrets of legume inoculation, I. A. SMITH (*Warren, Ind., 1913, pp. 22, pls. 2*).—The first part of this book takes up soy-bean culture, giving chapters on soils, rotation, special uses, methods of planting, cultivation, harvesting, threshing, yield of grain, seed, and varieties. The latter part takes up the phases of legume inoculation.

Sugar beet growing in Britain: Its effects on agriculture and rural life (*Brit. Sugar Beet Council: [London], 1911, pp. 28, fig. 1*).—This book discusses the sugar-beet industry, with special reference to agriculture and rural life. The 6 chapters cover the early history on the continent, statistics regarding the world's production, influence of the industry on rural economics, valuation of the crop, cost of production, and beet-sugar factories.

Inquiry into the sugar-beet culture in Germany, Austria-Hungary, and Belgium, BRUNEHANT ET AL. (*Enquête sur la Culture de la Betterave à Sucre en Allemagne en Autriche-Hongrie et en Belgique. Paris, 1910, pp. 115, pl. 1*).—This book is a digest of the observations of a committee who investigated the sugar-beet industry by visiting many farms, factories, and experiment stations of the above named countries. The subjects discussed are statistics, climatic conditions, soil, live stock, fertilizers, green manure, liming, fertilizer formulas, cultivation, sugar factory organizations, labor, value of the soil, implements, and machinery.

Three years' sugar-beet culture experiments, 1907-1909, M. WILLNER (*Arb. Deut. Landw. Gesell., 1911, No. 181, pp. 192*).—The results discussed were carried out under the direction of the German Agricultural Society during 1907-1909, and include 47 varieties grown at 33 different localities. The observations cover yield of beets, leaves, and sugar, the sugar content of the beets, the tendency to send up seed stalks, and behavior toward pests and diseases.

The average yields of beets for the 4 principal varieties for the 3 years were 36,361 kg., 32,922 kg., and 32,173 kg. per hectare. The sugar content was 16.5 per cent, 17.16 per cent, and 16 per cent, respectively.

Some data in regard to the sugar formation during the last few weeks before harvest show an increase of from 1.1 per cent sugar to 5.2 per cent, varying with the variety and the weather conditions.

Sugar-beet culture in Java, M. B. SMITS (*Teysmannia, 23 (1912), No. 10-11, pp. 657-668*).—This paper discusses the production of sugar beets, considering yields, percentage of sugar, cost of production, and market value. In a variety test the yields ranged from 43,350 to 48,253 kg. per hectare (from 19.29 to 21.47 tons per acre), and the sugar content from 16.38 to 17.22 per cent.

Cultivation of the teasel (*Jour. Bd. Agr. [London], 19 (1912), No. 9, pp. 738-742*).—This paper describes teasel (*Dipsacus fullonum*) and its commercial use, and gives methods for its cultivation as practiced in Europe and the United States. Suggestions for its improvement and cultivation are offered.

Tor grass or false brome, and its eradication from down pastures, H. P. HUTCHINSON (*Jour. Bd. Agr. [London], 19 (1912), No. 8, pp. 648-657, figs. 3*).—A description of this grass and its habit of growth is given, and its eradication by the application of quicklime, salts and gas lime, digging, and digging and turning is discussed.

From the results of trials the author recommends applying gas lime, "as fresh as possible, directly to the tufts at the rate of about 2½ cwt. per perch [280 lbs. per square rod]. The lime can be applied effectively at any time during the year. Five months, at least, should elapse from the time of application to the time of resowing. If it be desired to avoid the unsightly appearance of bare patches during the summer months, the gas lime should not be applied later

than November. Autumn and early winter applications seem to give the best results, as a large quantity of mold can then be worked up with the harrows the next spring.

"In places where grass lime can not be obtained, and where the tor grass exists as small, isolated patches, the best method of eradication would be to dig it out with a suitable spade to a depth of 3 in. Where large patches occur on land which is not on too steep a slope, the tor might be plowed out. The turf would require to be knocked about with chain or grass harrows until dry. It should then be burnt or left until killed by the weather. . . . Flowering should be prevented by mowing, grazing with sheep, or burning, and young tufts should be grubbed out and burnt when first seen."

Breeding experiments with winter wheat at Svalöf, 1910-1912, H. NILSSON-EHLE (*Sveriges Utsädesför. Tidskr.*, 22 (1912), No. 6, pp. 307-334, pls. 3).—New varieties of winter wheat bred at Svalöf and adapted for southern or central Sweden are described and discussed, and the yields obtained during the 3 years are given in detail.

Some germination experiments, 1910-11, M. HEINRICH (*Landw. Vers. Stat.*, 78 (1912), No. 3-4, pp. 165-178).—In the case of *Anthoxanthum odoratum*, the seeds germinated best in darkness and in a temperature ranging from 5 to 20° C. and changing every 5 days. With *Avena elatior*, an increase of 12.7 per cent in the germination was secured when the hulls were removed from the seeds. *Poa trivialis*, *P. pratensis*, *P. compressa*, and *P. nemoralis* all germinated better in direct sunlight than in diffused light or darkness.

Contradictory results were obtained with all the tests in regard to germination of seeds placed in cotton, filter paper, sea sand, yellow sand, garden soil, and meadow soil under various degrees of moisture and a uniform periodical change in the temperature.

Seed analyses: Their interpretation and use, S. F. ARMSTRONG (*Jour. Bd. Agr. [London]*, 19 (1913), No. 10, pp. 827-834).—The author points out the importance of seed analysis, since seeds constitute by far the most variable material the farmer has to purchase; and are at the same time, weight for weight, the most costly. The entire success or failure of a crop (and even of succeeding crops) may also be wholly determined by the kind or condition of the seed sown. Causes of the variation in the purity and germinating capacity, the object of seed analysis, interpretation of results, certificates of purity and germination, and tables showing the 1 per cent by weight grading, are discussed.

In the author's opinion, to arrive at the cultural value of seeds "it is necessary not only to know the percentage of pure seed present, but also the germination capacity of the latter. And here again it is important to urge that it is not merely the proportion of seeds which manage to germinate, but rather the nature or quality of the germination, which is the real measure of the value of the seed. For example, a sample of perennial rye grass which germinates up to 90 per cent in the course of 16 days is not nearly so good as a sample which gives a germination of 90 per cent in 6 days, other things being equal. . . .

"It is generally agreed that the formula:

$$\frac{\text{Percentage purity} \times \text{Percentage germination}}{100}$$

gives the real or cultural value of any seed. The main purpose of this article is to show that while this formula is true in theory, yet in practice an additional statement is required indicating the nature of the impurities present and the quality of the germination process. It is on such points as these that seed stations can give reliable information. The numerous seed impurities are

readily recognized by the expert, though most of them would be unobserved or unknown to the farmer. Moreover, the quality of the germination process is precisely indicated under the uniform conditions which can be secured at such an institution."

The application of the precipitin method in testing seeds, ZADE (*Fühling's Landw. Ztg.*, 61 (1912), No. 23, pp. 807-810).—The method described in this paper is essentially that used in the treatment of certain animal diseases. A salt solution extract of the meal of a given seed variety gave the customary reaction or precipitate with the precipitin prepared by the use of the solution of that variety, and gave different reactions with different varieties. American clovers and Italian clovers of the same variety gave different reactions.

The author points out the advantage this method will have in determining the variety in seeds whose outward appearance present no differences of identification, as well as the origin of varieties after it has been further tested.

The adulteration and misbranding of the seeds of Kentucky blue grass, redbtop, and orchard grass, B. T. GALLOWAY (*U. S. Dept. Agr., Office Sec. Circ.* 43, pp. 6).—In continuation of the seed inspection (*E. S. R.*, 27, p. 141), 1344 samples were examined during 1912. Of 499 samples of Kentucky blue grass, 62 were found to be either adulterated or misbranded, and 36 contained less than 3 per cent of it. Of 538 samples of redbtop, 115 were found to be adulterated with timothy, and of 307 samples obtained as orchard grass, 7 were found to be adulterated and 3 were rye grass.

Seed inspection (Maine Sta. Off. Insp. 46, pp. 12).—The chief requirements of the Maine law are stated and results of the 1912 inspection reported much as in previous years (*E. S. R.*, 26, p. 838). A list of drug and food prosecutions is appended.

Report of seed tests for 1912, O. I. TILLMAN, (*Bul. N. C. Dept. Agr.*, 33 (1912), No. 10, pp. 47, figs. 2).—Tabulated results of these tests are given, with comments upon cleaning tobacco seed and the standard of purity required by the state seed act.

The study of agricultural seeds, W. BORLASE (*Jour. Bd. Agr. [London]*, 19 (1912), No. 7, pp. 529-541, figs. 5).—The results of analyses of seeds here reported show that of red clover seed the higher-priced seed was the more economical. Grass mixtures showed adulteration ranging from 3.73 to 8.3 per cent. In low-grade seeds adulteration ran as high as 58.3 per cent.

The Indiana weed book, W. S. BLATCHLEY (*Indianapolis, Ind.*, 1912, pp. 191, figs. 139).—The first 50 pages of this book treat of such general subjects as distribution of weed seeds, how weeds lessen the output of the farm, benefits of weeds, classification of weeds according to life period, general rules for exterminating weeds, keeping the farm clear, and parts of a weed, including a key to families of weeds. The remainder of the work is a descriptive catalogue of Indiana weeds.

Goose grass (Galium aparine), W. WIEDERSHEIM (*Arb. Deut. Landw. Gesell.*, 1912, No. 203, pp. 29, pls. 11).—This gives results of experiments and discusses the economic value of this plant as a weed, giving a description, its occurrence, life history, the damage it causes, and methods of combating it.

Single plants were found to yield from 180 to 510 seeds. When thrown into water from 92 to 95 per cent sank immediately, and of those that floated only from 6 to 10 per cent germinated. In a germination test with garden soil, field soil, leaf mold, peat, sand, and sawdust, the average results ranged from 20 per cent in the sawdust to 90 per cent in garden soil.

The weed was found to occur 24 times in grain and cultivated fields as compared with 52 times in waste places. The chief injury to crops seemed to be in weighting down the maturing grain, and the admixture of the seeds injured

the quality of the grain as feed. After unsuccessful trials with iron sulphate, ammonium sulphate, sodium nitrate, and potassium chlorid as sprays, the author suggests the obtaining of seeds free from Galium as the best method of combating it.

Chemical analysis showed a moisture content of 9.75, protein 11.25, fat 4.2, nitrogen-free extract 64.42, crude fiber 6.58, and ash 3.8 per cent.

HORTICULTURE.

[Horticultural investigations in 1912], R. S. SETON (*Yorkshire Council Agr. Ed. and Univ. Leeds [Pamphlet] 85, 1912, pp. 41-45, fig. 1*).—Data are given on fertilizer tests with strawberries, together with variety tests of strawberries and other small fruits, and tests of various lawn mixtures, conducted at the Manor Farm of the University of Leeds in 1912.

Report of the government horticultural experimental fields in South Holland for 1912, C. H. CLAASSEN ET AL. (*Verslag Rijkstuinbouwproefvelden Zuid-Holland, 1912, pp. 101*).—This report is similar in nature to those issued for previous years (*E. S. R., 27, p. 842*).

Celery culture in Michigan, C. P. HALLIGAN (*Michigan Sta. Spec. Bul. 60, pp. 24, figs. 15*).—A popular treatise on celery culture, including information relative to soils and soil preparation, fertilizers, seeding, transplanting and planting operations, cultivation, blanching, harvesting, storing, marketing, diseases and insects, and varieties.

Cucumbers as a cash crop, W. POSTIFF (*Michigan Sta. Circ. 19, pp. 135-138*).—This circular contains concise directions for growing cucumbers.

Greenhouse tomato investigations, A. G. BOUQUET (*Oregon Sta. Bienn. Crop Pest and Hort. Rpt. 1911-12, pp. 44-50, figs. 5*).—A study of various factors influencing early and sustained yield in greenhouse tomatoes.

Out of 6 of the more important commercial forcing varieties tested Earliana and Bonny Best were considered especially promising, the former for its characteristics of earliness and productivity and the latter for its superior shape and quality combined with fair yield. The greatest number of fruits were secured from the flowers hand pollinated, although a superior yield was also secured by jarring the plants as compared with natural pollination.

Other phases being studied but not yet reported on include a study of individual variety blossoms and blossom clusters with special reference to the influence of variation in these characters on the production of marketable fruit, and comparative tests of rows and plants fertilized and unfertilized.

Notes on Jamaican vegetables, W. HARRIS (*Bul. Dept. Agr. Jamaica n. ser., 2 (1913), No. 6, pp. 180-202*).—This comprises popular descriptive notes on the various vegetables occurring in Jamaica, including information relative to their domestic utilization.

Notes on fruits in Jamaica, W. HARRIS (*Bul. Dept. Agr. Jamaica, n. ser., 2 (1913), No. 6, pp. 159-180*).—Notes similar to the above are given for the economic fruits of Jamaica.

Orchard spraying experiments in 1912, W. J. MORSE and G. A. YEATON (*Maine Sta. Bul. 212, pp. 57-72*).—Additional spraying experiments with lime-sulphur as a substitute for Bordeaux and with different arsenicals are reported (*E. S. R., 27, p. 440*). The experiments were conducted in an orchard of Ben Davis trees.

Owing to a misunderstanding only one of the experimental plats was sprayed 3 times, the first application being made before the blossoms opened. The other plats were sprayed for the first time just after the petals fell and again about 3 weeks later. The results show a striking beneficial effect in the control of

apple scab by the application of a spray before the flowers opened. On the plat which was sprayed 3 times with a mixture of $1\frac{1}{2}$ gal. of lime-sulphur and 2 lbs. of arsenate of lead to 48 $\frac{1}{2}$ gal. of water, 88.8 per cent of the apples were perfect, 1.4 per cent scabby, and 9.6 per cent russeted, as compared with 50.7 per cent of perfect apples, 47.6 per cent scabby, and 1.5 per cent russeted on the plat receiving only the last two applications of the same mixture. Similar striking differences in spray efficiency are noted between the plat receiving the 3 applications and other plats receiving 2 applications, either of lime-sulphur or Bordeaux. Although the authors do not contend that the later sprayings are unnecessary, it appears that, under the existing weather conditions in 1912, where the first spraying was omitted the profits derived from the 2 following sprayings paid little more than the cost of application.

A comparison of the plats which received only 2 applications shows that both arsenate of lead used at the rate of 4 lbs. to 50 gal. of water and a 2:2:48 solution of lime-sulphur-arsenate of lead was more efficient in checking scab and gave a larger percentage of good apples than a 3:3:50 Bordeaux mixture plus 2 lbs. of arsenate of lead. This was due primarily to the serious russetting of the Bordeaux which amounted to about 35.3 per cent. No unsprayed check plat was included in the experiment.

Both dry arsenate of lead and arsenite of zinc were tested as substitutes for arsenate of lead paste for use in combination with lime-sulphur. So far as could be observed none of these arsenicals produced any appreciable injury to the foliage. Their value as insecticides is not here compared but results from the standpoint of spray injury led to the adoption of dry arsenate of lead, owing to ease in mixing, in the spraying experiments for the following season.

Lime-sulphur as a summer spray, J. B. S. NORTON and T. B. SYMONS (*Maryland Sta. Bul. 164, pp. 263-272*).—This bulletin points out the necessity of summer spraying peach and apple trees to secure a good quality of fruit, reports the results of cooperative work conducted during the past 2 years in continuation of previous investigations (*E. S. R.*, 23, p. 252), cites briefly some of the worst diseases and insects attacking peach and apple fruits, and gives recommendations for their control.

The results of the spraying investigations as a whole led to the conclusions that self-boiled lime-sulphur 8:8:50 is an excellent protection against peach scab, and the best treatment for rot in view of the risk of injury from Bordeaux. The self-boiled mixture, however, is scarcely effective against most apple diseases. Sufficiently diluted concentrated lime-sulphur will control scab and rot of peach to a great extent but with some danger of foliage injury. A stronger dilution, say 1:40, is effective for most apple diseases except bitter rot but with some danger of burning the leaf and fruit. It is not so good a fungicide as Bordeaux but does not russet apples like the latter. Sulphocide used in effective strengths usually causes marked injury to foliage. The results obtained with atomic sulphur were too variable to be conclusive. Although arsenate of lead in the usual amount with lime-sulphur may cause some injury to peach foliage, it is believed that this is the most effective combination for controlling curculio.

Spray and practice outline for fruit growers, 1913, H. J. EUSTACE and R. H. PETTIT (*Michigan Sta. Spec. Bul. 61, pp. 23, figs. 11*).—This comprises directions for the treatment of the important diseases and insects of orchard and small fruits and potatoes, including instructions for preparing spray mixtures.

Fungicide and insecticide inspection (*Maine Sta. Off. Insp. 47, pp. 13-20*).—This comprises a report on samples of various fungicides and insecticides inspected in 1912.

Bud variation in relation to fruit markings, E. J. KRAUS (*Oregon Sta. Bien. Crop Pest and Hort. Rpt. 1911-12, pp. 71-78, pl. 1, fig. 1*).—A review of the literature, including notes on the author's observations relative to the effect of foreign pollen on the color in the immediate cross.

A study of the subject as a whole led to the following general conclusions: "Color in the pome fruits is not influenced directly in the immediate cross. New characters can not be added by the pollen, outside the seed itself, in the immediate cross. The manifestation of color is dependent on many environmental factors. Color as usually found is composed of a number of unit characters. Somatic segregation may occur and by this means the several factors or color manifest themselves more or less independently. The several colors may appear as bands more or less parallel, or a band of but one color surrounded by the normal color. Similar segregation may extend to any group of unit characters of which the plant is composed. Segregation may extend to either fruit or leaf buds, if [in] the latter such variations may be propagated asexually. Red in apples may consist of either a single or a complex of unit characters; at least 3 reds are recognizable. Somatic segregation may be of service to plant breeders as indicating the unit characters of a plant that are likely to exhibit themselves when propagated sexually. Segregation generally extends to the flower bud only in apples while in pears the shoot is frequently affected."

A bibliography of consulted literature is appended.

Seedless and malformed fruits, F. R. BROWN (*Oregon Sta. Bien. Crop Pest and Hort. Rpt. 1911-12, pp. 41-43, figs. 2*).—A short discussion of the author's observations relative to the effect of frost injury prior or subsequent to pollination on the development of the fruit.

Frost-fighting investigations, A. A. HELLER (*Nevada Sta. Rpt. 1911, pp. 21-23*).—Data are given on frost-fighting investigations conducted during the spring of 1911. Low temperatures were successfully combated for several days, even when the temperature went as low as 19° F. on one day. A continuation of these low temperatures, however, finally killed the blossoms and the experiment was terminated.

It is concluded that the station orchard is situated in a location unfit for experimental work, except to perhaps demonstrate the value of frost-fighting methods in the most favorable seasons.

[**Horticultural investigations**], P. B. KENNEDY and A. A. HELLER (*Nevada Sta. Rpt. 1912, pp. 25-29*).—A résumé of work in the station orchard, including notes on the adaptability of various cover crops and additional data on frost-fighting investigations in 1912 (see above abstract).

The results of the frost-fighting work indicate that the number of frosts to be contended with are too numerous to consider apple growing as a profitable business in the lowest parts of the Truckee Valley.

Frost investigation work of 1912, C. I. LEWIS and F. R. BROWN (*Oregon Sta. Bien. Crop Pest and Hort. Rpt. 1911-12, pp. 31-40, figs. 4*).—Continuing previous work (E. S. R., 25, p. 742), this comprises a report on the relative efficiency of various types of orchard heaters as tested in a prune orchard in 1912. The frosts occurring during the season were not severe enough to throw any light on the real value of orchard heaters.

Variety adaptability, C. I. LEWIS (*Oregon Sta. Bien. Crop Pest and Hort. Rpt. 1911-12, pp. 66-70*).—A short discussion relative to the effect of temperatures, altitudes, humidity, etc., on the adaptation of fruit varieties to different sections, including observations on the adaptation of various varieties in some of the coast districts in the Willamette Valley and in portions of eastern Oregon.

Varieties of fruit recommended for planting in Utah, L. D. BATCHELOR (*Utah Sta. Circ. 8, pp. 77-80*).—This comprises a list of recommended varieties

of fruits for Utah which has been prepared by the author in cooperation with the several county horticultural inspectors.

The use of fertilization in apple orchards, J. P. STEWART (*Ann. Rpt. Vt. State Hort. Soc.*, 10 (1912), pp. 74-93).—A summarized account of the author's investigations at the Pennsylvania Station (E. S. R., 28, p. 143).

Pruning the apple orchard, L. D. BATCHELOR (*Utah Sta. Circ.* 9, pp. 81-104, figs. 24).—A popular treatise on the principles and methods of pruning.

The drying of prunes, F. R. BROWN and F. C. BRADFORD (*Oregon Sta. Bien. Crop Pest and Hort. Rpt.* 1911-12, pp. 51-58, figs. 2).—A descriptive account is given of the methods and equipment employed in evaporating prunes in the Pacific Northwest, including some data on efficiency and cost of operating various types of driers.

A prune survey of Oregon, C. I. LEWIS, F. R. BROWN, and F. C. BRADFORD (*Oregon Sta. Bien. Crop Pest and Hort. Rpt.* 1911-12, pp. 8-30, figs. 8).—This comprises the results of a survey of the prune industry in 9 counties in Oregon. Data were collected on some 700 prune orchards with reference to the following phases: Varieties, age of orchards, distance from shipping point, exposures, size of orchards, soils, planting systems, stocks, age of bearing, pruning, cultivation, cover crops, fertilizers, fungus diseases, insects, spraying, fresh prunes, picking for the drier, the profitable orchard unit, intercropping, costs and profits, and yields per acre. In connection with a discussion of the data, suggestions are given relative to improvements in methods of culture, handling, and marketing.

Small fruit culture, F. A. WILKIN (*Michigan Sta. Spec. Bul.* 59, pp. 3-16).—A brief practical treatise on the culture of small fruits in Michigan, including lists of varieties for that region.

The loganberry in Oregon, V. R. GARDNER (*Oregon Sta. Bien. Crop Pest and Hort. Rpt.* 1911-12, pp. 59-65).—A popular treatise on loganberry culture, based upon a study of methods of growing and handling the crop in Oregon.

Directions for blueberry culture, F. V. COVILLE (*U. S. Dept. Agr., Bur. Plant Indus. Circ.* 122, pp. 3-11).—A paper on this subject, based largely on the author's experimental studies in blueberry culture (E. S. R., 24, p. 443). The present paper discusses the special requirements of blueberries, value of superior stocks, propagation, field planting, yields, and profits.

The only data to be secured relative to the yields and profits on a cultivated blueberry plantation were obtained from a 2½-acre plantation in Indiana, started in 1889. The profits per acre from this plantation in 1911 and in 1912 were \$139 and \$147, respectively. The author suggests that with bushes propagated from selected stocks, the yields should be greater and the profits correspondingly higher.

Comparison of cuttings from grafted grapes and from grapes growing on their own roots, F. BACO (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 15, pp. 1167-1169).—The author presents data to show that with certain varieties of grapes used as scions grafting not only causes specific variations but that these variations may be perpetuated by cuttings. Variations in the vegetative parts also appear to be accompanied by specific variations in the root system.

Ornamental trees and shrubbery, compiled by G. M. WILEY (*N. Y. State Ed. Dept., Arbor Day Ann.*, 1913, May 2, pp. 56, figs. 45).—A compilation of material relating to the planting, care, and appreciation of trees and shrubs, prepared with special reference to Arbor Day exercises. A reference list of books and other publications dealing with ornamental arboriculture is included.

Starting a lawn, C. P. HALLIGAN (*Michigan Sta. Circ.* 20, pp. 140-142).—This circular comprises popular suggestions on lawn making, including varieties of grass suitable for lawns in Michigan.

Rose geranium culture in Algeria. L. DUCCELLIER (*Ecole Agr. Algér. Maison-Carrée, Inform. Agr. Bul. 14, 1913, pp. 41, pls. 2, figs. 11*).—This bulletin discusses the rose geranium with reference to its history, botany, climatic and soil requirements, cultural details, and the distillation of essence of geranium. Figures are also given on the cost of culture and the commerce of the essence industry.

The violet book. A. and D. ALLEN-BROWN (*London, New York, and Toronto, 1913, pp. 109, pls. 10, figs. 3*).—A popular work discussing in detail the culture of violets, choice of varieties, and diseases and insects injurious to violets. A general account is also given of the authors' experience in growing violets.

FORESTRY.

Forest atlas: Geographic distribution of North American trees.—I, Pines. G. B. SUDWORTH (*U. S. Dept. Agr., Forest Serv. Atlas, pt. 1, pp. 2, pls. 36*).—This is the first part of a series of maps intended to show the geographic distribution of all North American trees now known, exclusive of those occurring wholly in Mexico.

The geographic distribution of 36 species of pines each on a separate map is shown in the present part. The ranges outlined for the pines are based on all available published and unpublished data of reliable character.

Municipal reclamation of waste lands. B. A. HEINLY (*Municipal Jour., 33 (1912), No. 25, pp. 895-897, figs. 2*).—A descriptive account of the black locust plantations owned by the city of Los Angeles, Cal.

Progress report of forest administration in the Province of Assam for the year 1911-12. A. V. MONRO (*Rpt. Forest Admin. Assam, 1911-12, pp. 20+53+3, pl. 1*).—A report on the constitution, management, and administration of the state forests of Assam, including a financial statement for the year. Data relative to alterations in area, forest surveys, forest working plans and miscellaneous work, forest products, revenues, expenditures, etc., are appended in tabular form.

The date sugar industry in Bengal.—An investigation into its chemistry and agriculture. H. E. ANNETT ET AL. (*Mem. Dept. Agr. India, Chem. Ser., 2 (1913), No. 6, pp. VI+281-389, pls. 12*).—This comprises a detailed survey of the date-palm sugar industry in Bengal. The following phases are discussed: History and statistics of production, other sugar-producing palms, the agriculture of the date palm, tapping, yield and composition of the juice, methods of analysis, factors influencing yield and composition, and manufacture. Consideration is also given to the commercial aspects of the industry, including suggestions for improvements.

On some preliminary observations regarding the causes of natural change in the latex of *Hevea brasiliensis*; and on the depolymerisation of caoutchouc and its conversion, G. S. WHITBY (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 25 (1912), Sect. I-Ve, App., pp. 597-621, fig. 1*).—An analysis of the causes and conditions of natural coagulation in the latex of *H. brasiliensis*, including a review of the literature on the subject.

As a result of his observations the author is led to the hypothesis that in order adequately to explain the changes that spontaneously occur in Hevea latex it is necessary to assume the activity of 4 agencies, namely, a coagulating enzym, an oxidase, anaerobic putrefaction, and aerobic putrefaction.

Chemical treatment of waste wood. H. K. BENSON (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 25 (1912), Sect. I-Ve, App., pp. 331-337*).—An experimental study of the utilization of debris from

logging operations in the Pacific Northwest is here reported. The data presented are discussed under the general headings of steam distillation products, destructive distillation products, and hydrolyzed or fermentation products.

The experiments cited show that high grade commodities may be obtained from the waste wood. This waste wood is of enormous quantity but its successful utilization appears to lie in the production of commodities which may be sold in somewhat locally restricted regions.

DISEASES OF PLANTS.

The fundamentals of general phytopathology, H. KLEBAHN (*Grundzüge der allgemeinen Phytopathologie. Berlin, 1912, pp. 147, figs. 74*).—The author discusses the causes of plant diseases from the standpoint of the influence of chemical and physical properties of soils, meteorological conditions, cultural practices, wounds and their accompanying phenomena, parasitic organisms, both plant and animal, and innate conditions, such as enzymes, constitution of protoplasm, etc.

Diseases of agricultural crops, A. LEGAULT (*Maladies Cryptogamiques des Plantes Agricoles. Lille, 1911, pp. 82*).—This work popularly describes the more important diseases of the principal agricultural and horticultural crops. Brief keys are given by which the cause of the disease may be readily recognized, after which the effect on the host plant is described and methods of treatment are suggested.

Some important plant diseases of Oregon, H. S. JACKSON, H. P. BARSS, and F. D. BAILEY (*Oregon Sta. Bien. Crop Pest and Hort. Rpt. 1911-12, pp. 218-308, figs. 58*).—This consists of a general account of some of the more important diseases occurring in the State, and is the result of general survey work embodying the observations of the staff of the department and the results of minor investigations and experimental work together with the results of other observers. Among the diseases described are crown gall, mushroom root rot of tree and small fruits, diseases of pomaceous and stone fruits, nut crops, small fruits, vegetables, and field crops.

Plant protection, F. G. STEBLER (*Landw. Jahrb. Schweiz, 27 (1913), No. 1, pp. 18-20*).—Observations and results of experiments on various diseases are given.

Loose smut was found to attack more than half of the plants used for crossing varieties of barley. This result was attributed to the necessary clipping and consequent exposure incident to artificial fertilization. *Tylenchus devastatrix* was noted as checking the growth of oats. Foot disease of wheat (*Ophiobolus*) was noted in some sections. A leaf roll of potatoes was thought to be due to a *Fusarium*. It is claimed to have been found that spores of *Phytophthora* are able to infect potato leaves not only through the stomata but also through the epidermis at any point. Red clover was attacked severely by canker (*Sclerotinia trifoliorum*). A rust (*Colletotrichum lindemuthianum*) severely attacked beans, for which trouble disinfection of seeds is considered impractical as a defensive measure.

Injury to soil by noxious substances produced by the fungus parasites of plants, E. PANTANELLI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 22 (1913), I, No. 3, pp. 170-174, fig. 1*).—Experiments employing gelatin or other cultures of *Fusarium incarnatum* in connection with several plants attacked by this parasite are said to show that substances are produced during the development of the fungus and diffused through the substratum which may arrest the growth of roots or the germination of seeds of such plants.

Control of stalk nematodes (*Tylenchus devastatrix*), A. VAN LUNIK (*Cultura*, 25 (1913), No. 293, pp. 9-17).—This includes a review of previous work by A. Spieckermann and others, in part already noted (E. S. R., 26, p. 545), also a brief discussion of means of combating nematodes, and deals mainly with the method of trap plants.

Buckwheat is regarded as well suited to this purpose as it is severely attacked by the nematodes, which ascend high in the plant. Two cuttings, moreover, are possible in the summer. Oats and rye are also severely attacked, and clover in less degree. Barley and wheat are not attacked, this fact favoring their employment for rotation. Disinfection of the soil is found to be difficult and expensive, but some encouraging results have been obtained.

Sensitiveness of cereals to fungicidal treatment in 1912, and suggestions for dipping, H. C. MÜLLER and E. MOLZ (*Deut. Landw. Presse*, 40 (1913), No. 16, pp. 190-192; *Landw. Wchnschr. Sachsen*, 15 (1913), No. 8, pp. 65-68).—In the dry year of 1911 it was found that, while wheat was fairly resistant to the hurtful influence of fungicidal treatments, barley sometimes showed a high degree of sensitiveness. This was ascribed to scarcity of moisture during a large part of the growing season of that year. In 1912 it was found that both wheat and barley suffered but little deterioration from the hot-water treatments, or from formaldehyde (used in 0.25 per cent strength of the 40 per cent solution), while the copper sulphate treatment caused serious injury as regards germinability and vigor. The water treatment recommended for barley is immersion for 4 hours at from 25 to 35° C., followed by dipping for 10 minutes at from 50 to 52°. For wheat, soaking for 4 hours at from 30 to 40°, and then 10 minutes at from 52 to 53°, was found to be fairly effective and safe.

Dry spot of oats, H. CLAUSEN (*Illus. Landw. Ztg.*, 33 (1913), No. 7, pp. 45-48, figs. 2).—This is a continuation of work already noted (E. S. R., 24, p. 449), the conclusions of which have been criticized by Kuhnert (E. S. R., 29, p. 46). The author reports the results of several experiments as to the influence of fertilizers on growth and on yield of grain and straw.

From these, excellent results were obtained by use of 100 kg. per hectare (89 lbs. per acre) of manganese sulphate. This salt is also considered safe to use in connection with other fertilizers. The effect of an application on the crops of future years is to be the subject of further observations.

Dry spot of oats, W. KRÜGER and G. WIMMER (*Deut. Landw. Presse*, 40 (1913), No. 18, pp. 213, 214).—The authors claim that dry spot of oats is a form of heart rot, referring to their previous studies on heart rot of beets (E. S. R., 21, p. 446), and to those of Clausen (see above). The trouble is attributed to the chemical composition of the soil, which is either deficient, or unsuited or poisonous to the plant. It is held that experiments carried out with cultures in sandy soils point to their successful use in combating this heart rot in the open fields.

Premature death of wheat, W. GROSSER (*Ztschr. Landw. Kammer Schlesien*, 16 (1912), No. 30, pp. 942, 943; *abs. in Mycol. Centbl.*, 2 (1913), No. 2, p. 111).—Study of conditions for several years led the author to conclude that *Ophiobolus*, *Fusarium*, and *Leptosphaeria* attack wheat only after it has been weakened by unfavorable conditions, such as genuine parasites, imperfect nourishment, too thick sowing, weeds, or wet cold weather.

The susceptibility of wheat to stinking smut in relation to time of seeding, O. MUNERATI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 21 (1912), II, No. 12, pp. 875-878; *abs. in Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 3, pp. 482, 483).—This is a continuation of work previously noted (E. S. R., 26, p. 54). The results of four

years' experimentation and the conclusions stated by the author may be summarized as follows:

The seedlings of wheat experimented with in 1910-11, taken in order of least susceptibility shown to *Tilletia tritici*, were those made on March 27, October 12, November 9, and February 22. Spores of 1909 showed little less vitality in this connection than did those of 1910. In the same order of immunity, the dates of 1911-12 seedlings were September 28, March 27, October 12, and February 29. The late September and late March sowings, in soil strewn with spores of *T. tritici* showed from 0.5 to 1 per cent infection, while seeds already infected sown on these dates showed as high as from 3 to 8 per cent of attack. All these seeds had been subjected to the treatment of copper sulphate followed by lime.

It is concluded that seeds even strongly infected are not necessarily attacked by stinking smut. Temperature at the time of seeding and during the first stages of growth, and rapidity of early development, are considered to play an important part, and these may be employed to supplement fungicidal treatment, which, however, is very important in case of late fall or early spring seeding, especially with those treatments promoting quick development. Adherent mixtures, as copper sulphate with lime, do not always prevent attack due to spores already present in the soil, but in many cases these are rendered harmless by contact with the protecting layer, due to the persistent qualities of the copper.

These findings are thought to explain the fact that in previous years untreated seed produced smut-free crops, alternating with those showing severe infection, the latter being due presumably to slow growth during the early phases of development of the young plants. It is suggested that, in experiments instituted to test the real efficiency of any fungicide to be used against *Tilletia*, it is well to sow grain either late in autumn or early in spring in order to secure high susceptibility of the test grain to the fungus.

Smut experiments (*Queensland Agr. Jour.*, 30 (1913), No. 2, pp. 97-99).—Experiments of 1912 are said to have borne out the observation that the early maturing rust-resisting varieties of wheat are more prone to rust than the later ones. An apparent exception was noted in case of Florence, but this may have been due to a lack of uniformity in the infecting spores. The 30 varieties tested are given, with the results from each.

Two new methods of smut prevention were tested, the copper sulphate and salt and the 1:30 sheep dip. Both were found to be of no value. The germination percentage of 1912 was considerably lowered by excessive moisture in the soil.

A root disease of *Paspalum dilatatum* (*Agr. News [Barbados]*, 12 (1913), No. 284, p. 94).—A brief note is given on a disease of *P. dilatatum* grown in Montserrat. This introduced grass is reported as having grown well at first, but was subsequently attacked by a root disease. An examination of the diseased clumps revealed conditions which resembled those of cane roots attacked by *Marasmius sacchari*. Upon breaking up the root clumps two small agarics were found, one a species of *Marasmius* and the other apparently a species of *Crepidotus*. On account of the lack of material it was impossible to determine whether the fructifications belonged to the mycelium which is believed to have destroyed the grass.

A hitherto but little recognized potato disease (*Hypochnus solani*), J. ERIKSSON (*Meddel. Centralanst. Försöksv. Jordbruksområdet*, 1912, No. 67, pp. 11, figs. 5; *K. Landtbr. Akad. Handl. och Tidskr.*, 51 (1912), No. 7-8, pp. 550-558, figs. 5).—The author gives the history of the disease and describes its appearance in Sweden. The methods of control recommended are (1) avoiding

the use of potatoes for seed on which small black sclerotia (*Rhizoctonia solani*) are found (best seen when the skin of the potatoes is moistened, and (2) refraining from planting potatoes for from 2 to 3 years on land on which potatoes have grown which show a white covering on the stem (*H. solani*) or black sclerotia on the tubers, or on land directly adjoining such fields.

Infection experiments with *Phytophthora infestans*, L. GARBOWSKI (*Centbl. Bakt. [etc.]*, 2. Abt., 36 (1913), No. 19-25, pp. 500-508, pl. 1).—In the effort to find a nutritive medium of known composition for the study of pure cultures of *P. infestans*, the author experimented with infection material from potatoes in decoctions of several closely related plants, also in various solutions of definite chemical composition. It is stated that Knop's solution with addition of glucose fulfils the requirements of such medium for *P. infestans*.

Pests and diseases of sugar beets, 1912, O. FALLADA (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw.*, 42 (1913), No. 1, pp. 19-33).—In addition to brief discussions of weather conditions and insect injuries, the author gives the results of observations on various injuries, diseases, etc., of roots and leaves. *Cercospora beticola* was found in connection with leaf spots. The so-called frog spawn fungus (said to include *Leuconostoc mesenteroides* and *Clostridium gelatinosum*) takes considerable sugar from the sap in the formation of its characteristic zoogloea, which was studied under various conditions.

Root tumors, A. STIEFF (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw.*, 42 (1913), No. 1, pp. 9-18, figs. 6).—Previous work (E. S. R., 27, p. 544) having shown that two forms of beet tumor exist, one having slight connection and designated as ligature tumor and the other having closer connection and designated as an outgrowth, experiments were instituted to ascertain the chemical differences between each form and the main body of the beet. The results were very variable and unpromising.

A dry rot of sweet potatoes caused by *Diaporthe batatatis*, L. L. HARTER and ETHEL C. FIELD (*U. S. Dept. Agr., Bur. Plant Indus. Bul.* 281, pp. 38, pls. 4, figs. 4).—A description is given of a dry rot of sweet potatoes, attention to which was first called by Halsted (E. S. R., 2, p. 416). In this publication the trouble was attributed to a pycnidial stage of the fungus, described as *Phoma batatae*. The authors have succeeded in isolating the ascogenous form of the fungus and have given it the name *D. batatatis* n. sp. (E. S. R., 28, p. 548).

The disease is said to be principally a storage trouble, and is characterized by a drying and shriveling of the potato. It also occurs in the hotbed and in the field, although the organism is not a vigorous parasite and consequently under ordinary conditions does not become evident until some time after harvesting.

The different stages of the fungus have been investigated and both were derived from the same isolation. Inoculations with pure cultures of the pycnidial stage have proved successful both in the greenhouse and in the field, and successful infections were obtained from reisolations.

The disease is believed to be disseminated principally by means of the seed and by the use of decayed potatoes for manure. Diseased potatoes should be cooked before feeding to stock and should never be scattered on the field as a fertilizer. Seed beds should be sterilized and potatoes to be used for seed carefully selected.

Apple tree anthracnose, H. S. JACKSON (*Oregon Sta. Bien. Crop Pest and Hort. Rpt.* 1911-12, pp. 178-197, figs. 9).—This is a preliminary report on a study of the apple tree anthracnose, formerly attributed to *Glæosporium mali-corticis* (E. S. R., 12, p. 58). The life history of the fungus is traced at length, and the perfect form described under the name *Neofabræa malicorticis* (E. S. R., 27, p. 649).

The disease is said to be common throughout the Northwest, being known as apple tree anthracnose or black spot canker. The fungus develops in the bark, cambium, and to some extent in the sapwood, infection occurring in the fall and early winter. The fungus matures slowly during the summer in the dead bark of the cankers thus formed, finally producing the perfect form mentioned above.

Both the conidial and ascospore stages have been found on pear trees, and cankers have been produced by inoculation with the conidial stage of the fungus isolated from the apple. Cankers have also been produced by inoculation with the fungus from the apple transferred to peach, prune, and cherry branches, but no spores have been observed to be matured in these cankers.

No evidence has been secured that new cankers are formed by the spread of the fungus from the tissues of old ones. The fungus has, however, been isolated from the heartwood, and the extent and importance of the fungus as a heart rot is to be investigated.

Control measures have been described elsewhere (E. S. R., 27, p. 249).

The "rough-bark" disease of the Yellow Newtown apple, J. W. ROBERTS (U. S. Dept. Agr., Bur. Plant Indus. Bul. 280, pp. 16, pls. 3, figs. 2).—In the summer of 1909 the author's attention was called to a disease, locally known as rough bark, which is said to be prevalent in certain sections of Virginia.

The first appearance of the disease is found in the sinking of definite areas of the bark, which later enlarge, turn black, and finally crack or break open about their margins, resulting in a roughened bark effect. The disease may continue to develop, sometimes involving an entire branch, but the chief destruction seems to be to the smaller branches, as the larger limbs and the trunk, though injured and badly roughened, are seldom deeply girdled. The disease, so far as known, is confined to the variety Yellow Newtown. It is due to a species of fungus to which the author has given the name *Phomopsis mali* n. sp.

Trees which are in good growing condition are said to be usually exempt from attacks of the fungus, and fertilization and cultivation, together with proper pruning, are believed to be effective means in keeping the disease in check.

The fungus was found to grow on leaves previously diseased, often following *Sphaeropsis malorum*, but is not a serious leaf disease. It also produced a rot of the fruit, but this is believed to be of rare occurrence in nature.

Sooty blotch on apples, J. A. MCCLINTOCK (*Mich. Farmer*, 140 (1913), No. 14, p. 425, fig. 1).—A popular account is given of the sooty blotch of apples, due to the fungus *Leptothyrium pomi*, with suggestions for its control. This disease is said to have been especially troublesome in Michigan, being very common on Northern Spy, Baldwin, Greening, Red Canada, Pewaukee, and Mann apples in various parts of the State.

Cherry gummosis, H. P. BARSS (*Oregon Sta. Bien. Crop Pest and Hort. Rpt.* 1911-12, pp. 198-217, figs. 10).—A preliminary report is given of an investigation of cherry gummosis, the study of which was begun by F. L. Griffin and attributed by him to *Pseudomonas cerasus* (E. S. R., 26, p. 144).

The author began his study in February, 1912, and has confirmed many of the previous observations and conclusions. The experiments seem to indicate that the blighting and gumming of buds and spurs on some varieties of the sweet cherry is due to the bacterium mentioned above. It is also able to produce gumming when inoculated into the body and branches of these varieties. Other bacteria similar to *P. cerasus* have been found during the spring in nearly all splitting cankers on the trunks and limbs as well as in diseased spurs,

and by inoculation into healthy trees these are able to produce gumming. There is at least one other type of bacteria not uncommon in tissues affected by gummosis. From observations carried through one season it appears that the disease spreads rapidly in the spring and very slowly or not at all during the summer and autumn. At present it is said to be impossible to state positively that bacteria are responsible for all the more serious phases of the disease on the body of the tree or to indicate just what part they play in its spread.

For prevention and control the use of resistant stocks is advised, among them being the Mazzard cherry and the Lambert cherry. Cutting out the cankers and cutting off the small affected twigs have given evidence of being valuable in controlling this disease, and the author urges growers to adopt this practice.

A partial bibliography is appended.

Pear rust (*Gymnosporangium sabinæ*), E. SCHEIBENER (*Gartenwelt*, 17 (1913), No. 10, pp. 131-136, figs. 9).—The author states that *G. sabinæ*, the cause of a rust in pear trees, employs as alternate host not only *Juniperus sabinæ* but *J. virginiana*, which is common as an ornamental tree, thus constituting an additional menace to pear orchards. Parallel descriptions of these two junipers are given, and the removal of both from the neighborhood of pear culture is considered necessary.

The black knot of plums, G. H. COONS (*Mich. Farmer*, 140 (1913), No. 14, pp. 425, 453, figs. 2).—A popular account is given of the black knot of plums, which also affects cherries, with suggestions for its control. The fungicide recommended is a dilute commercial lime-sulphur solution.

The germination of the winter spores of grape downy mildew, L. RAVAZ and G. VERGE (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 11, pp. 327-331, figs. 8).—The authors conclude from a study of the germination of the winter spores of *Plasmopara viticola*, which are to be found on fragments of leaves, that it will be possible to foretell the probable time of the first attack of the fungus on grapevines.

Some investigations on the development and treatment of downy mildew, H. FAES (*Rev. Vit.*, 39 (1913), No. 999, pp. 161-165; *Terre Vaud.*, 5 (1913), No. 9, pp. 87-91, figs. 2).—The author reports negative results in attempting to inoculate grape leaves with the winter spores from old leaves, but a high degree of success was attained when conidia were placed on the lower surfaces of the leaves. Experiments in the germination of the oospores carried on at irregular intervals from April 10 to July 8 failed to show any germination. The experiments with infection by means of conidia are said to confirm observations previously reported (*E. S. R.*, 26, p. 550) that infection is through stomata on the lower sides of leaves. Spraying experiments in 1912 are considered to have been unsatisfactory.

Diseases of cacao and means for their control, L. MARTINEZ (*Bol. Dir. Gen. Agr. [Mexico]*, *Rev. Agr.*, 2 (1912), No. 6, pp. 520-532).—The author discusses a number of diseases of cacao with associated fungi, among which are a canker of the shoots connected with *Nectria theobromæ* and *Calonectria flavida*; brown rot of the pods, with *Phytophthora faberi* or a *Peronospora*; witches' broom, with *Exoascus theobromæ* or *Colletotrichum luxificum*; and a spreading disease of the roots, with *Macrophoma vestita* and *Lasiodiplodia theobromæ*. The latter of these is also associated with a black rot of the pods, and is said to be a very important fungus in the Tropics.

Remedies include removal and destruction of affected parts where practicable, use of fungicides, and in general strict sanitation.

Canker of oleander, A. TONELLI (*Riv. Agr. [Parma]*, 19 (1913), Nos. 2, pp. 18-21, fig. 1; 3, pp. 34-36, figs. 3; 4, pp. 51, 52, fig. 1).—A cankerous disease of oleanders is described, which is apparently increasing in violence in parts of Italy. The disease is said to attack the trunk, both older and younger branches, flowers, leaves, and young fruits. From microscopical examinations, infection experiments, etc., it is supposed to be of bacterial origin. The organisms are said to attack first the cambium, killing and destroying the cells, resulting in protuberances and distortions. It is then carried to sound parts mainly by such animal parasites of oleander as *Aspidiotus nerii*, Lecanium, Tetranychus, etc. Aside from such agencies its spread seems to be slow and comparatively slight.

Means of control suggested are the use of Bordeaux mixture, cutting off affected parts at safe distances below the points of infection and their destruction by fire, careful disinfection of all tools used on diseased plants, and destruction of the animal parasites on the oleanders.

The supposed European origin of the American chestnut canker, E. PANTANELLI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 21 (1912), II, No. 12, pp. 869-875).—This is a comparison of the fungus associated with chestnut blight disease in the United States, classified as *Diaporthe parasitica*, with the European form, *Endothia radicalis*, with which it has been alleged to be identical.

The conclusion is reached that *D. parasitica* is an *Endothia*, closely allied to *E. radicalis* (which itself is said to be not a homogenous species), but not identical therewith, the American form being designated as *E. parasitica*. The latter is considered to be not of European origin, being able to attack readily the European chestnuts in the warm parts of Italy, while these are much more resistant to *E. radicalis*. It is stated, however, that recent American experiments have shown that *E. radicalis* is able to produce on the American chestnuts the same damage as is caused by *E. parasitica*.

Studies on black canker of chestnut trees, L. PETRI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 21 (1912), II, Nos. 11, pp. 775-781; 12, pp. 863-869, fig. 1).—As a result of studies on black canker of chestnut, it is stated that in the early stages of this disease, at least two separate infections may be distinguished. One is of the lower trunk and larger roots, ascending to the upper trunk and larger branches, and always precedes the other, which attacks first the smaller branches, later descending to the younger roots which it seems to prefer. It is thought that the latter fungus, *Coryneum modonium*, is not the primary infection but that it is preceded and possibly regulated by *Endothia radicalis*, which is also said to favor the development of several ordinary root rots. Varying the supply of calcium carbonate produced no appreciable effect on the disease, which was not shown to have any general relation to nutrition. *C. modonium* is said to lower rapidly the vitality of the plant. Experimental reproduction of these infections did not appear to be successful.

A leaf spot of Eucalyptus pulverulenta (*Agr. News [Barbados]*, 12 (1913), No. 284, p. 94).—A young tree of this species of Eucalyptus in the Botanic Garden of Montserrat is said to have exhibited irregular, discolored areas on the leaves, which upon examination showed that they were filled with bacteria. No work has been carried on, however, to confirm the supposition that they are the cause of the disease.

Drying of larch needles due to Cladosporium laricis and Meria laricis, A. FIORI (*Bul. Soc. Bot. Ital.*, 1912, No. 8, pp. 307-312, fig. 1).—A discussion is given of these two fungi and the symptoms of each as appearing on the foliage, with suggestions as to preventive or remedial measures. These are more

effective with the young plants and consist principally in collection and burning of all diseased parts, though spraying with Bordeaux mixture is also suggested.

Micro-organisms of maple sap.—III. Technical description of certain bacteria occurring in maple sap, H. A. EDSON and C. W. CARPENTER (*Vermont Sta. Rpt. 1912*, pp. 475-602, pls. 8).—The authors give an account of *Bacillus aceris* n. sp., an organism causing a certain type of stringy maple sap, the morphological and other features of the organism being described at length. A brief description is also given of the pink cocci of maple sap, which appear to belong to the type of *Micrococcus roseus*. The contribution concludes with an account of the green fluorescent bacteria occurring in maple sap, 42 strains of which were investigated, 7 being exhaustively studied. All the strains seem to belong to the *liquefaciens* and *nontliquefaciens* varieties of *Pseudomonas fluorescens*.

A bibliography is appended.

Fruiting bodies of dry rot fungus, K. HAVELÍK (*Živa [Bohemia]*, 1912, p. 13; abs. in *Bot. Centbl.*, 122 (1913), No. 4, p. 97).—After a study of the formation of the fruiting bodies of *Merulius lacrymans*, the author concludes that the development and morphological characters of the hymenium depend entirely upon its position and the degree of moisture, and that the different forms observed are only biological phenomena, having no value as systematic characters.

Recent observations on dry rot, K. HAVELÍK (*Centbl. Gesam. Forstw.*, 39 (1913), No. 2, pp. 60-65).—The author briefly sums up some results of observations recently made on the various rots of structural timber, among these Lenzites, *Polyporus vaporarius*, *Coniophora cerebella*, and in particular *Merulius lacrymans*.

The last-named is said to be a most dangerous rot of houses, tending to spread to every part of the building and to extend its attack to neighboring structures, and being very difficult and expensive to eradicate when once established. It is said to propagate itself either by a very delicate mycelium or by spores, the latter being given off from each 0.5 mm. square of fruiting surface at the rate of from 60 to 200 every five minutes. It is said to be not always, if ever, dependent upon rottenness, moisture, or warmth, though favored by these, especially the last. It is thought to be often brought into houses with materials used in repairs, etc., or on tools previously used on infected structures. It has frequently been found in the neighborhood of telephone booths, its appearance being ascribed to the moisture and warmth of the batteries or to the lack of ventilation, infected sawdust, etc., in the walls of the booths. It is recommended that buildings be better ventilated, that floors in suspected buildings be laid in asphalt, and that all tools and materials used in repairs be rigidly inspected or disinfected.

The wetting power of fungicides, H. FONZES-DIACON (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 11, pp. 331, 332).—On account of the number of new fungicides that are advertised and the claims made for them, the author recommends their testing by making up about a liter of the solution and dipping into it a freshly cut grape leaf. Upon drying, the covering power of the fungicide will be shown by the deposit which is left on the leaf.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Index zoologicus, II, C. O. WATERHOUSE, edited by D. SHARP (*London, 1912*, pp. 324).—This second volume (E. S. R., 14, p. 844) consists of an alphabetical list of names of genera and subgenera proposed for use in zoology as recorded in the *Zoological Record*, volumes 38 to 47, inclusive (1901-1910), and

the zoology volumes of the International Catalogue of Scientific Literature, annual issues 1 to 10, together with other names not included in previous nomenclators.

In the first volume it is estimated that the number of names in Scudder's Nomenclator is about 80,000 to which were added some 40,000 in that index. In the present volume some 22,000 names are recorded, of which, however, an uncertain number are due to erroneous readings. It is concluded that 140,000 names have been, up to the present time, proposed for the genera and subgenera of zoological taxonomy.

Plague eradication in Porto Rico, R. H. CREEL (*Jour. Amer. Med. Assoc.*, 60 (1913), No. 20, pp. 1527-1532, figs. 6).—In Porto Rico *Mus norvegicus*, *M. alexandrinus*, and *M. rattus* infest houses, the first-named predominating. *M. alexandrinus* is said to be the species chiefly found in rural districts.

[Report of] department of entomology, S. B. DOTEN (*Nevada Sta. Rpt.* 1911, pp. 34-38).—The author presents a brief report of the work carried on during the year. Investigations were made of an outbreak of a cutworm, which proved to be *Euxoa ridingsiana*, which devastated alfalfa fields in the Monitor Valley.

Report of department of entomology, S. B. DOTEN (*Nevada Sta. Rpt.* 1912, pp. 36-40).—A brief statement of the work of the year with parasitic and predaceous enemies of the codling moth, of observations of cutworms injurious to alfalfa, of the European elm scale, etc.

Report of the department of entomology (*Oregon Sta. Bien. Crop Pest and Hort. Rpt.* 1911-12, pp. 79-176, pls. 4, figs. 70).—The first part of this report consists of papers by H. F. Wilson on plant lice attacking orchard and bush fruits in Oregon, the shot hole borer of the Northwest, or the pear blight beetle of the East (*Xyleborus dispar*), the smaller shot hole borer (*X. saeseni*), codling moth, San José scale, tent caterpillars, cherry and pear slug, some very serious insect pests liable to be introduced into Oregon, and animals troublesome in garden and orchard. Papers by A. L. Lovett deal with strawberry pests in Oregon, the currant maggot or gooselberry fruit fly, the cabbage and radish maggot (*Phorbia brassicæ*), and the garden slug (*Limex agrestis*). Miscellaneous insect pests of orchard and garden are dealt with by H. F. Wilson and A. L. Lovett.

Check list of California insects, IV, C. W. WOODWORTH (*Mo. Bul. Com. Hort. Cal.*, 1 (1912), No. 13, pp. 941-948).—A continuation of the list previously noted (*E. S. R.*, 28, p. 155).

Host index to California Coccidæ, C. F. BAKER and E. O. ESSIG (*Mo. Bul. Com. Hort. Cal.*, 1 (1912), No. 10, pp. 740-763).—This is a revision of the list previously noted (*E. S. R.*, 21, p. 757).

The grape leafhopper, H. J. QUAYLE (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 3-4, pp. 375-382).—A general account of this insect, studies of which by Johnson (*E. S. R.*, 27, p. 758) and by Hartzell (*E. S. R.*, 28, p. 855) have been previously noted.

In California the grape leafhopper occurs in greatest numbers in the San Joaquin and Sacramento valleys. It also occurs in the coast valleys but is seldom injurious there; and also in southern California, but south of the Tehachapi it is most serious as a pest in the Imperial Valley.

A few facts concerning the fruit flies of the world, G. COMPÈRE (*Mo. Bul. Com. Hort. Cal.*, 1 (1912), Nos. 10, pp. 709-730, pl. 1, figs. 12; 11, pp. 842-845; 12, pp. 907-911; 13, pp. 929-932, figs. 2).—A general discussion of the fruit flies and their enemies, based upon the author's investigations in various parts of the world, including Palestine, Egypt, Malta, Brazil, Australia, India, etc.

Observations on the life history of a new species of Psychoda, P. S. WELCH (*Ann. Ent. Soc. Amer.*, 5 (1912), No. 4, pp. 411-420, figs. 11).—A new species of dipteran, here described as *Psychoda albimaculata*, was studied at the Chicago Sewage Testing Station, where they were found breeding in the sludge of the sprinkling filters in great numbers. Collections from the filters often contained all of the life stages from the egg to the adult.

Stomoxys calcitrans, C. K. BRAIN (*Ann. Ent. Soc. Amer.*, 5 (1912), No. 4, pp. 421-432, figs. 17).—This paper consists of descriptive and biological notes made in South Africa during the course of feeding experiments with the stable fly in connection with the transmission of a trypanosome disease. It is stated that in the laboratory of the Government Experiment Station, at Rosebank, near Cape Town, over 40 per cent of the flies caught during a period of one week were *S. calcitrans*, whereas in a living room, approximately 35 ft. away, *Musca domestica* comprised as high as 95 per cent of the flies caught, and *S. calcitrans* represented less than 3 per cent of the whole.

Wistaria gall fly (Agromyza schineri), E. O. AMUNDSEN (*Mo. Bul. Com. Hort. Cal.*, 1 (1912), No. 10, pp. 730-733, figs. 4).—The author reports that some 40 or more wistarias in a shipment of several hundred from Japan were found at inspection upon arrival to be infested by this gall fly. According to the tags all of the infested plants produced pink blooms while the healthy plants produced other colors. Descriptions are given of the several stages of this fly.

The Psoroptes communis ovis.—Some observations on ova and ovipositing, **S. STOCKMAN and A. H. BERRY** (*Jour. Compar. Path. and Ther.*, 26 (1913), No. 1, pp. 45-50, figs. 3).—The authors conclude from counts made of masses of eggs from a known number of females that the average per female was considerably above 15. The estimate reached as high as 30 in one observation, and it is believed that the total number of eggs deposited by a single female may even exceed that number. It was found that the laying period lasted much longer than the hatching period. Several larvæ hatched from eggs which had been immersed in an arsenical dip for one minute, but none hatched from eggs which had been immersed in a creosote dip for half a minute.

FOODS—HUMAN NUTRITION.

Mutton and its value in the diet, C. F. LANGWORTHY and CAROLINE L. HUNT (*U. S. Dept. Agr., Farmers' Bul.* 526, pp. 32, figs. 2).—In addition to general data regarding the nutritive value and digestibility of mutton, information gathered in connection with the nutrition investigations of the Office of Experiment Stations is summarized. A large number of recipes for preparing mutton for the table, which have been studied and standardized, are given.

In its composition and nutritive value mutton is practically the same as beef. The average loss of weight in preparing the two kinds of meat for the table is also practically the same. However, there are cases in which mutton is the more economical, since a side of mutton can be economically purchased for home use where a side of beef is too large for such a purpose.

"Judged by its composition, palatability, wholesomeness, digestibility, relative cost, and the number of ways in which it can be prepared for the home table, mutton is an important foodstuff, which is well worth the attention of the housekeeper who wishes to provide her family with an attractive and palatable diet at a reasonable cost."

Natural immunity in the development of fertile hens' eggs, V. RUŽIČKA (*Arch. Hyg.*, 77 (1913), No. 7-8, pp. 369, 370).—The author notes the fact that the fertilized hens' eggs which he was studying never became infected, although

his methods gave ample opportunity for infection. He believes that the fertilized eggs possess a natural immunity against bacterial infection.

Further experimental work with pathogenic bacteria is suggested.

The influence of cooking on the physico-chemical behavior of human milk, cow's milk, and buttermilk, P. GROSSE (Biochem. Ztschr., 48 (1913), No. 6, pp. 427-431).—The Bechhold ultrafiltration method was employed by the author to test the question whether the ionization of salts, especially calcium salts, in buttermilk resembled that in human milk more closely than is the case with whole milk.

He concludes that the noncolloidal nitrogenous residue (i. e., the nitrogenous material not precipitated by phosphotungstic acid) in human milk is higher than in cow's milk and that a larger proportion of phosphoric acid and calcium in human milk occurs in forms free from large colloidal complexes. Buttermilk contains nearly all the calcium and phosphoric acid in a free form and, in this respect, resembles human milk more closely than does whole milk. This characteristic of buttermilk is due to the acid fermentation which it has undergone and which, in the other milks, presumably takes place only in the stomach.

Graham flour—a study of the physical and chemical differences between graham flour and imitation graham flours, J. A. LECLERC and B. R. JACOBS (U. S. Dept. Agr., Bur. Chem. Bul. 164, pp. 57).—Results based on the examination of many samples of such flours found on the market and in mills, as well as of samples prepared in the laboratory of the Bureau of Chemistry, are reported concerning the physical and chemical differences between graham flour and imitation graham flours.

The report is summarized as follows:

"Although a large percentage of the so-called graham flour on the market is made by mixing inferior grades of flour with bran, there are a great many millers who still make graham flour in the original way, namely, by grinding either on stones or on rolls the whole kernel of the wheat without bolting.

"True graham flour always shows relatively larger amounts of intermediate products, such as coarse and fine middlings of good grade, while imitation graham generally contains but small amounts of these same products and when these are present in large quantities they are of inferior grade. True graham contains a larger amount of combined bran and shorts, of combined coarse and fine middlings, and a smaller amount of flour passing through the 100 sieve, than does imitation graham. The ash, fiber, and pentosans are present in larger amount in true than in imitation graham. The middlings of the true graham are of a higher character than those of imitation graham. This refers to both coarse and fine middlings. The bran of imitation graham is very often clean and free from adhering endosperm, while the bran of true graham usually contains a relatively large quantity of such endosperm. This is more or less true also of the shorts.

"One does not depend entirely upon the quantity of these intermediate products to determine whether or not a flour is genuine, but one must always determine their quality as well and their relation to each other in appearance and composition, so that it is necessary to make a macroscopic examination of the products of separation besides the chemical analysis. Out of a total of 83 samples of graham and imitation graham flours examined for this bulletin and reported herein it was not difficult to differentiate between these two classes. In examining an imitation graham flour there was always some point, and, many times, a number of points, which differentiated it from a true graham and which made it impossible to classify it among the latter."

Appended to the bulletin are definitions of the milling and chemical terms used in it.

The manufacture of a 'sweet flour from the sugar beet and its use in human and animal nutrition, A. AULARD (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 25 (1912), Sects. I-Ve, App., pp. 479-483).—This article describes the process of making a flour from the dried sugar beet. The chemical composition of this "beetmeal" is given and its possible use in human and animal nutrition is discussed.

Hop sprouts, an early spring salad (*Pure Products*, 9 (1913), No. 4, pp. 167, 168).—According to this article, hop sprouts are an early spring vegetable of characteristic aromatic flavor. They may be used like asparagus and are available before it is on the market.

In hop-growing regions, the excessive shoots sent out from the stool of the old plants are thus used, while in France and Belgium the plants are especially cultivated for the shoots. Hop shoots appear in the market both fresh and canned, the latter being prepared by cleaning and bunching, blanching, draining, placing in cans with salt water, and sterilizing.

Fungi and composition of Japanese tamari-koji, J. HANZAWA (*Mycol. Centbl.*, 1 (1912), No. 6, pp. 163-166).—Tamari-koji is a variety of soy-bean sauce prepared from the beans without the addition of wheat or other cereal such as used in making common soy sauce.

The beans are soaked until they are swollen 2 or 3 times their original size, boiled from 13 to 14 hours, kneaded, and formed into balls called "miso-dama." These are laid on trays for several days and become coated with fungi, in which state they are known as tamari-koji, the word "koji" having special reference to the ferments present. The soy is finally prepared by drying, adding brine, and allowing the mass to ferment slowly for from 7 to 10 months, then pressing it and cooking the liquid. The residue is used as miso.

The chemical composition of tamari-koji shows less moisture and more nitrogenous matter, especially albumin, than that of ordinary soy. Some investigators find the chief fungus to be the same as that of ordinary soy, namely, *Aspergillus oryzae*; others find no trace of this in tamari-koji. In the author's laboratory, where the *Aspergillus* was not found, the 3 most abundant fungi appeared to be *Mucor mucedo*, *Penicillium glaucum*, and *Cladosporium herbarum*. Chemical analysis showed that the changes in the composition of beans produced by these fungi were relatively slight, and much less than was noted by other investigators who found *A. oryzae* as the chief fermentative agent.

Roselle, D. S. PRATT (*Philippine Jour. Sci.*, Sect. A, 7 (1912), No. 3, pp. 201-207, pls. 2).—Roselle (*Hibiscus sabdariffa*), as grown in the Philippines, is here described and its chemical analysis reported.

Less water and sucrose and more mineral matters and malic acid were found than in analyses reported from the United States. The malic acid, the method of determining which is described at length, was found to be present in dextro-rotatory form. Though the calyx is the portion of the plant from which the best quality, and especially the best color, of sirups and jellies, can be made, there is sufficient flavoring matter in the stems and leaves to permit their use. Roselle flavoring sirup is made by soaking and straining the calyxes, either with or without the stems and leaves, boiling down the liquid thus obtained until it is one-third of its original volume, adding cane sugar as desired (usually in equal volume), and boiling until the latter is dissolved. The resulting sirup has an attractive acid taste and may be used diluted as a beverage or for flavoring sherbets, soda water, etc. Roselle wine is also made.

The nitrogenous constituents of lime juice, C. FUNK (*Biochem. Jour.*, 7 (1913), No. 1, pp. 81-86).—In this article, which is a preliminary report of

an attempt to isolate an antiscorbutic substance from lime juice, a number of new compounds which were found are described, but none possessed antiscorbutic properties.

Homemade malt extract for nursing mothers, O. W. WILLCOX (*Pure Products*, 9 (1913), No. 4, pp. 179-184, figs. 2).—This article gives practical directions for the household preparation of malt extract from barley, along with a general discussion of its nutritive value and that of commercial preparations.

Our national food supply, J. LUMSDEN (*London and Leipsic*, 1912, pp. 96).—This is a discussion of the problem presented by the increasing cost of food in Great Britain, the solution of which the author sees in gradual nationalization of land.

Food of the people and rising prices, LICHTENFELT (*Volksernährung und Teuerung*. Stuttgart, 1912, pp. 61).—This study, which deals chiefly with conditions in Germany, includes a survey of the sources of food materials and their possible increase, of nutritive requirements, and of consumption and cost of food, and gives suggestions for lessening the latter, especially by a cooperation between producer and consumer.

The fixation of the prices of meat in the markets of Barcelona, J. ALGARRA Y POSTIUS (*Formación del Precio de las Carnes en el Mercado de Barcelona*. Barcelona, 1912, pp. 128).—This discussion of the general and local causes of the rise and variations in the price of meats was undertaken during the period of extreme high prices in the autumn of 1911, and includes such topics as the general economic laws governing the price of agricultural products, increased consumption, increased wages, defects of the system of weights in use, problems of transportation, the Spanish monetary system, custom-house regulations, the conditions of markets, the effect of speculation in meats, etc. Tables of statistics are also appended.

Household statistics—an historical and methodological investigation, C. ALBRECHT (*Haushaltungsstatistik—eine literarhistorische und methodologische Untersuchung*. Berlin, 1912, pp. VIII+126, fig. 1).—This book is a technical statement of the historical development, significance, nature, and methods of systemized statistics of household economy.

School feeding—its history and practice at home and abroad, LOUISE S. BRYANT (*Philadelphia and London*, 1913, pp. 345, pls. 16, figs. 6).—In this volume the author has brought together from a great variety of sources, including answers to letters of inquiry and official documents, information regarding school feeding. Such subjects are discussed as the history and present status of the school feeding movement, physical deterioration and malnutrition in England, provision of meals in the public elementary schools of Great Britain and similar enterprises in other European countries, lunches in American elementary schools, provision of meals in open-air schools, investigation of underfeeding among American school children, the symptoms, causes, results, and classification of malnutrition in childhood, and the food needs of growing children. A chapter on school menus summarizes the results of an analytical study of penny lunches sold to New York school children, and other data. Most of the material is brought together for the first time and the presentation is nontechnical.

An annotated bibliography supplements the volume, and in an appendix legislative enactments in various countries regarding school feeding are given, as well as menus used in the schools of Bradford, England, specimen recipes of hot dishes served in Philadelphia schools, and dietaries prepared at Drexel Institute for children of school age showing school meals as supplements to other meals, and daily cost and food value. An introduction is contributed by P. P. Claxton.

Food in health and disease, N. S. DAVIS (*Philadelphia, 1912, 2. ed., pp. XII + 449, figs. 5*).—In this volume, which is designed as a practical book on dietetics, the author discusses the general principles of diet in health and disease and the general questions of feeding the sick and diet in different diseases.

It is stated that in preparing the second edition much of the material has been rewritten and additions have been made to almost every subject discussed.

Modern theories of diet and their bearing upon practical dietetics, A. BRYCE (*London, 1912, pp. XV + 368*).—On the basis of personal observation and study the author discusses the theory and practice of vegetarianism, low-protein dietaries, and purin-free or uric-acid-free dietaries; and dietetic theories associated with mineral salts, water, raw food, curdled milk, fasting, and other systems. General questions of metabolism are also considered.

Some statements from the concluding chapter, on the practice of moderation, follow :

A consideration of the arguments advanced for and against the various dietetic systems "will suffice to reveal the only principle which is of universal application in the selection of a diet. It is obvious at the very outset to the scientific mind that there can be absolutely no justification for the claims made by each set of propagandists for the wholesale adoption of their tenets and practice, because the personal factor which is of such vital importance in all human affairs is overwhelmingly so in the question of diet. . . .

"It has been held that popular taste is an infallible indicator of the best and most suitable nutritive items in a nation's bill of fare, and doubtless there is a period in the history of every country, before it has emerged from its primary isolation and come into contact with other nations, when this may be true. In such circumstances the selection of food is dictated less by choice than by necessity, and as the resources of most countries are strictly limited—and this remark applies with especial force to the most robust and vigorous peoples living in temperate climates—the choice is by no means boundless. It has been claimed that racial features have thus been molded, and that the character of a people owes its origin in great measure to its food. But there is absolutely no authority for the statement that the character of a man is influenced by what he eats. . . . Diet does not alter the character or personality, but in large measure the personality decides the most suitable diet."

As the author notes, the one thing upon which the believers in low-protein diet, in a flesh-free diet, and in a purin-free diet agree is "the diminished amount of food, and so the only conception which appears to unite them is the fundamental doctrine of moderation, which has not only been taught from time immemorial, but is actually practiced by all sensible men at the present time."

The author states that he does not doubt "that most of the systems detailed may be made to answer the nutritive and dietetic requirements of everyday life for individual cases, and, as has been proved by experience, some of them may even be suitable for considerable sections of people." He does not think, "however, that any one of them has succeeded in demonstrating its right to the proud position of the universal food of mankind in the temperate zone." He is personally inclined "to favor the claims of the low-protein system as on the whole the most satisfactory solution of the dietetic problem, but probably more reflective people will acquiesce in the proposition that the healthy man can live on any system of diet by attention to moderation, regularity, and variety, but the unhealthy man must look to the dietetic expert to guide him in the selection of the best system or kinds of food to suit his case."

The volume contains a bibliography and an index.

A note concerning the influence of diets upon growth, F. G. HOPKINS and A. NEVILLE (*Biochem. Jour.*, 7 (1913), No. 1, pp. 97-99).—A brief preliminary report of data, to be published in full later, concerning the influence of such complex substances as lipoids on growth, which disagrees with results obtained by other workers.

Influence of food on the amylase content of human saliva, C. L. EVANS (*Biochem. Ztschr.*, 48 (1913), No. 6, pp. 432-447).—This progress report of experiments on the diastatic strength of human saliva under different conditions of diet, starvation, etc., is summarized by the author as follows:

The amount of amylase in saliva is increased after a meal containing the three principal nutritive ingredients. The increase begins from 20 to 30 minutes after eating, lasts 2 or 3 hours, and then, having reached its maximum, gradually decreases until the next meal. If a meal is omitted, the activity of the saliva remains constant after the effect of the last meal has passed off. When food is chewed, but not swallowed, no increase in the amylase content is observed, nor does any occur after a meal consisting entirely of protein.

The simplest explanation of these phenomena seems to be found in the assumption that they depend on a hormone developed in the stomach through the action of the products of carbohydrate digestion upon the mucous membrane of that organ. The chief cause of the increase of amylase in the saliva is the increased amount of enzymes in the parotid saliva, which possesses four times the activity of the remaining saliva and is nearly half as great in volume.

The differences in the peptic digestibility of wheat and oats, M. KLOTZ (*Monatsschr. Kinderheilk.*, 11 (1912), No. 1, pp. 29-37; *abs. in Zentbl. Expt. Med.*, 2 (1912), No. 4, p. 152).—It having been shown that oat starch undergoes cleavage with diastatic ferment more readily than wheat starch, additional experiments were made with peptic ferments. These showed that the protein of wheat flour was much more thoroughly digestible by peptic and tryptic ferments than the protein of ground oats.

Results of a different character were obtained when starches made from the two grains were used, the protein of the oat starch being practically as digestible as that of the ground oats and more digestible than the protein of the wheat starch. From this it appears that the wheat contains two different proteids, of which one is found in the starchy portion, and that this is less readily attacked by ferments.

The rate of protein catabolism, E. P. CATHCART and H. H. GREEN (*Biochem. Jour.*, 7 (1913), No. 1, pp. 1-17).—The protein foods studied were added on a particular day to diets of low, medium, and high protein content upon which the subject was maintained for several days before and after the special foods were added. The total output of sulphur and nitrogen in the excreta was determined, as were the creatin and creatinin.

The results of the investigation showed the sulphur-containing part of the protein to be more rapidly catabolized and the sulphur more rapidly excreted than the nitrogen after ingestion. When protein is superimposed on a low protein diet, part of the nitrogen is retained and "apparently stored in the tissues as a pabulum of uniform composition." From the study of the ratio of sulphur to nitrogen, the authors conclude that the increase in the output of sulphur and nitrogen after a protein meal is due to the catabolism of the actual material ingested and not to the displacement of worn-out protoplasm from the tissues. No effect of the superimposition of protein was noticed on the output of creatinin.

The physiological nitrogen minimum, K. THOMAS (*Arch. Anat. u. Physiol., Physiol. Abt.*, 1910, Sup., pp. 249-285).—This article includes a general discussion of minimum nitrogen metabolism under different conditions and the report of experiments made by the author, some for extended periods with himself as

subject, others with dogs. The experiments were planned to show the coefficient of utilization (Abnut zungsquote) of nitrogen metabolism, the demands of the body for nitrogen during muscular work, and the prevention of the formation of excessive protein in the circulation when meat was gradually added to a nitrogen-free diet. The physiological nitrogen minimum was determined with a carbohydrate diet, a fat diet, and a nitrogen-free diet to which nitrogen was gradually added.

The author concludes that the physiological nitrogen minimum under given conditions is determined by 3 factors, the biological value of the protein in the food (i. e., its power of replacing cell substance), the storage of protein (i. e., in the cells and circulation), and the extent of the energy exchange in the body. The physiological nitrogen minimum equals the coefficient of utilization when the nitrogen of the food and that of the body are quantitatively the same, when the storage of protein is prevented by the gradual addition of ingested protein, and when the conditions of comparative experiments, with nitrogen starvation and with the ingested nitrogen just sufficient to maintain the nitrogen balance, are such that the energy requirement of the body remains unchanged.

[The gaseous exchange and metabolism in a diet poor in nitrogen], N. ZUNTZ and P. SCHIROKICH (*Separate from Med. Klinik, 1912, No. 32, pp. 5*).—At a meeting of the Physiological Society of Berlin, June, 1912, the senior author reported metabolism experiments carried on in his laboratory with a subject who had for 3 months been living on a diet of potatoes and butter, and who advocates prolonged chewing and insalivation as a means of increasing the percentage of food material digested and decreasing the energy required for the processes of digestion.

There were 2 experiments, the first of 5 and the second of 9 days' duration. All ingested and excreted materials were measured and the gaseous exchange and body heat were determined. In the first experiment, the daily ration consisted of 1,500 gm. of potatoes and 150 gm. of margarin, yielding 5.35 gm. of nitrogen and 2,750 calories of energy. In the second experiment, the amount of potatoes consumed averaged 1,101 gm., with 150 gm. of butter, but toward its close isodynamic amounts of bacon fat and tomato purée were substituted for part of the butter, the total daily ration yielding on the average 4.415 gm. of nitrogen and 2,116 calories of energy.

During the first experiment, 77.2 per cent of the nitrogen was digested, 95.2 per cent of the energy was available, and there was a daily average loss of 0.50 gm. of nitrogen from the body. During the second experiment, the coefficient of digestibility for nitrogen was 76.4 per cent, the availability of energy 94.6 per cent, and the average nitrogen loss 0.962 gm. per day. As Rubner's figures for the digestibility of nitrogen and availability of energy in potatoes are 80.5 per cent and 95.4 per cent, respectively, the investigators do not find that the peculiar method of insalivation produces the effect claimed by the subject, or that the diet was sufficient to maintain the nitrogen balance.

The energy expended in 24 hours per kilogram of body weight was 19.19 calories in the first experiment and 19.33 calories in the second, figures very similar to those obtained by Atwater and Benedict with fasting subjects during rest experiments in the respiration calorimeter, namely, 20.9 and 20.0 calories. During part of the first experiment there was slight fever and considerable restlessness, and the figures obtained for gaseous exchange and the calorimetric measurements are, therefore, unsatisfactory.

The body without food gave off 1,471 calories in 24 hours. The amount of food taken in 24 hours supplied 2,002 calories. The difference between these two, 531 calories, is the amount available for digestive work and muscular activity. In the first experiment the quantity was even larger. The food sup-

plied 2,619 calories available energy per day and the energy required when fasting was 1,458 calories, a difference of 1,161 calories or 79.6 per cent. This would suffice for a moderately active man with little work.

Advantages and disadvantages of calculating energy values in dietetics, O. KRUMMACHER (*Festschrift gewidmet 84. Versamml. Deut. Naturf. u. Ärzte, Med. Naturw. Gesell. Münster, 1912, pp. 245-262; abs. in Zentbl. Physiol., 26 (1912), No. 19, pp. 881, 882*).—According to the author's conclusion, the diet of an adult man of the average size should contain about 100 gm. protein, with a sufficiency of energy.

The hydrolysis of glycogen by diastatic enzymes—comparison of preparations of glycogen from different sources, R. V. NORRIS (*Biochem. Jour., 7 (1913), No. 1, pp. 26-42, figs. 4*).—Data are given regarding the hydrolysis by a pancreatic enzyme of samples of glycogen obtained from a dog, a rabbit, oysters, and yeast cells, together with the effect of a number of factors on the rate of reaction.

The different results obtained with the various samples indicated that they were not of identical composition, and other experiments are now in progress to furnish more knowledge on this point.

Metabolism of calcium and phosphoric acids in infants receiving scanty and abundant diets of cow's milk, G. WOLFF (*Über den Kalk- und Phosphorsäurestoffwechsel des Säuglings bei knapper und reichlicher Ernährung mit Kuhmilch. Inaug. Diss., Berlin, 1912, pp. 29; abs. in Zentbl. Physiol., 26 (1912), No. 23, pp. 1152, 1153*).—In experiments in which the diet of infants was quantitatively increased, it was found that the phosphoric acid excreted in the urine varied similarly to the nitrogen, but the principal excretion of phosphorus was in the feces and appeared to come from the framework of the body.

When a scanty diet was given, the calcium excreted from the intestines was in excess of the amount in the food and must have been drawn in part from the organism itself. The utilization of fat was in no case especially good, but seemed to have little influence on the metabolism of calcium, even when the amount of fat in the diet was considerably increased.

In general, the author concludes that changes from scanty to abundant diets produce no unfavorable effect on the metabolism of nitrogen, phosphoric acid, and calcium, and that a diet which only makes a nitrogen balance, or even permits a slight increase in body nitrogen, is insufficient to meet the demands of the organism for calcium and phosphorus. In his opinion, the dangers of a too abundant diet are less than those of a scanty one.

The metabolism of organic phosphorus compounds—their hydrolysis by the action of enzymes, R. H. A. PLIMMER (*Biochem. Jour., 7 (1913), No. 1, pp. 43-71*).—This paper gives the results of an experimental study of the hydrolytic action of the enzymes of the pancreas, liver, and intestine, and of various plant enzymes upon the more important organic phosphorus compounds found in food materials.

These compounds are not assimilated as such but undergo hydrolysis by the mucosa of the intestine and are probably absorbed as inorganic phosphates and the organic radical with which the phosphorus has been combined. These experiments agree with those of other workers who have shown the ability of the animal organism to synthesize its organic phosphorus compounds from inorganic phosphates, but they are not in accordance with the belief that organic phosphorus compounds are a necessary part of the food of animals. The author concludes that the value of these compounds depends entirely upon the nature of the organic matter in combination with the phosphoric acid.

Potassium excretion under normal and pathological conditions, E. BLUMENFELDT (*Ztschr. Expt. Path. u. Ther., 12 (1913), No. 3, pp. 523-528*).—As a

part of a contribution to the discussion of the question whether potash salts, especially potassium acetate, should be substituted for common salt in nephritis, an experiment with a normal subject is reported.

Changes in the gaseous metabolism under the influence of muscular work—the results of a new technique, J. M. LAHY and G. HELITAS (*Jour. Physiol. et Path. Gén.*, 14 (1912), pp. 1129–1137; *abs. in Zentbl. Biochem. u. Biophys.*, 14 (1913), No. 15–16, p. 548).—A method is described for the determination of carbon dioxid in the expired air, which is based on the use of the Orsat gas apparatus.

The apparatus, which contains exactly 1 liter, is filled with a sample of the expired air, the total volume of which is measured by passing through a gas meter, and the percentage of carbon dioxid in this is determined from its loss in volume after treating with potassium or sodium hydroxids. The authors believe that the greater number of and more frequent analyses made possible by this method give better information regarding the fluctuations in the composition of the expired air, and offset the inferior precision of the method as compared with the gravimetric method usually employed.

ANIMAL PRODUCTION.

Artificial climates for biological investigations, H. PRZIBRAM (*Abs. in Zentbl. Physiol.*, 24 (1910), No. 17, p. 802; *Jahrb. Wiss. u. Prakt. Tierzucht*, 7 (1912), pp. 203, 204).—The author describes methods of constructing rooms for keeping experimental animals and plants, so that temperature and other variable factors can be under control.

On the proof of biochemical reactions, their inheritance, and their forensic significance, E. VON DUNGERN (*München. Med. Wehnschr.*, 57 (1910), No. 6, pp. 293–295).—Experiments with dogs and man led the author to believe that the ability of the blood to react in certain ways is inherited, and that if so reactions of the blood of the offspring may furnish evidence as to their ancestry.

The production of sperm iso-agglutinins by ova, F. R. LILLIE (*Science*, n. ser., 36 (1912), No. 929, pp. 527–530).—The experiments herein reported indicate that, in some of the lower animals at least, there are sperm iso-agglutinins in the ova which are specific, and according to what is known concerning the laws governing antigens and antibodies the specificity of fertilization rests on a biochemical explanation. The union of ovum and spermatozoon, therefore, is not a process in which the sperm penetrates by virtue of its mechanical process, but one in which a peculiarly intimate and specific biochemical reaction plays the chief rôle.

The effect of spermatoxin on the female organism and the egg, M. P. TUSHNOV (*Uchen. Zap. Kazan. Vet. Inst.*, 28 (1911), Nos. 1, pp. 1–83; 2, pp. 103–164; *abs. in Jahrb. Wiss. u. Prakt. Tierzucht*, 7 (1912), p. 197).—Female rabbits were immune against pregnancy when motile spermatozoa in physiological salt solution were injected into the blood or into the abdominal cavity. No changes were observed in the condition of the ovary, and it is therefore supposed that a spermatoxin is formed in the blood.

The parthenogenetic segmentation of the eggs of hybrid ducks, A. CHAPPELLIER (*Compt. Rend. Soc. Biol. [Paris]*, 72 (1912), No. 23, pp. 1010–1012, fig. 1).—This is a study of the germinal vesicle of unfertilized eggs of the domestic duck (*Anas boschas*) and the Barbary duck (*Cairina moschata*).

An egg from the oviduct showed distinct blastomeres but no nuclei. In the laid egg the blastomeres were formed, but rapidly disorganized. The absence of chromatin or the special chromatic affinities, as well as the instability of

the blastomeres, leads to the supposition of a quantitative or qualitative chromosomal inefficiency as the cause of nonfecundibility of these hybrid eggs.

The intra-uterine growth cycles of the guinea pig, J. M. READ (*Arch. Entwickl. Mech. Organ.*, 35 (1913), pt. 4, pp. 708-723).—It was found possible to obtain a curve showing the uterine growth of the young in the guinea pig by weighing the mother at regular intervals during pregnancy, as the ratio of the weight of the litter to the mother is very high. One growth cycle began at fertilization of the ovum and continued for 60 days. A second cycle began a little before the end of the first, and continued on after birth.

"In both the guinea pig and man birth occurs during the course of a cycle and not at or near the juncture of 2 cycles. The human young are born before the completion of the first cycle, while the guinea pig completes 1 cycle and begins a second in utero. It is quite likely that this fact accounts for the advanced state of development of the latter animal at birth."

Effects of castration on the hypophysis and other glandular organs, A. MARRASSINI and L. LUCIANI (*Arch. Ital. Biol.*, 56 (1911), No. 3, pp. 395-432, pls. 2; *abs. in Zentbl. Expt. Med.*, 2 (1912), No. 5, pp. 208, 209).—A résumé of investigations on the methods of castrating, and the effects of castration on the internal organs of cattle, sheep, rabbits, guinea pigs, and poultry.

The histogenesis of the pineal body of the sheep, H. E. JORDAN (*Amer. Jour. Anat.*, 12 (1911), No. 3, pp. 249-276, pls. 3).—A search for evidence indicating a physiological function for the pineal organ in the cat, dog, guinea pig, rabbit, rat, opossum, calf, sheep, and man by the author and others seemed to negative its functional importance because the organ was so small. A more thorough study was made of the pineal body in the sheep because it was of unusual size, but there was no clear histological evidence which indicated a glandular function, and it is thought that if it is of any importance whatsoever it is probably active only during the first 8 months of post-natal life.

Hypertrophy of the testicles and comb after the removal of the pineal gland in fowls, C. FOÀ (*Arch. Ital. Biol.*, 57 (1912), No. 2, pp. 233-252, figs. 4).—A review is given of studies on the histology and physiology of the pineal gland in many species of animals, the author's work being chiefly with fowls.

As a result of removing the pineal gland from male fowls at the age of from 20 to 30 days the size of the comb and the testicles was very much increased. In the case of pullets growth was somewhat retarded for a time, but there were no differences observed at maturity between the normal and experimental animals.

The physiological action of extracts of the pineal body, H. E. JORDAN and J. A. E. EYSTER (*Amer. Jour. Physiol.*, 29 (1911), No. 2, pp. 115-123, figs. 5).—The experiments with the pineal gland of sheep indicated that it contains some substance which causes a fall of blood pressure, associated with a vasodilatation in the intestines, when subcutaneous injections were made into dogs, cats, and sheep. It also produced a slight degree of improvement in the beat of the isolated cat's heart, and caused a transitory diuresis associated with glycosuria in about 80 per cent of the cases.

On errors of random sampling in certain cases not suitable for the application of a "normal" curve of frequency, M. GREENWOOD, JR. (*Biometrika*, 9 (1913), No. 1-2, pp. 69-90).—The present memoir is an attempt to show to investigators in biology and medicine the limitations of the "normal" curve of errors with the binomial standard deviation mpq , which is so commonly used to determine the reliability of a series of observations and experiments.

This formula rests upon certain assumptions, and if either p or q be very small unless m is very large, and for all values of p and q when m is very small,

the normal curve does not approximate closely to the binomial. The following rules are given for practical work when p is known or assumed:

"When m is small, say less than 25, the binomial expansion should be directly evaluated. When m is moderately large and p or q not small, say not less than 0.1 the ordinary method based on the 'normal' curve can be trusted. If m is moderately large and p or q less than 0.1, a skew curve of Type III should be fitted from the momental constants of the binomial and the areas between assigned ordinates estimated with the help of quadrature formulas."

New contributions to the knowledge of domesticated animals of ancient Crete, C. KELLER (*Vrtljschr. Naturf. Gesell. Zürich*, 57 (1912), No. 1-2, pp. 282-290).—A brief account of fragments found since an earlier report (E. S. R., 26, p. 267). As the domesticated animals in Crete appear to be of the same type as those which existed at a later period in the Swiss pile works, the author suggests that there was a migration of people from the Mediterranean islands to Central Europe.

Report of the zoometrical studies made in 1912 at live-stock exhibits in Paris, Rouen, and Poitiers, VOITELLIER (*Bul. Mens. Off. Renseign. Agr. [Paris]*, 12 (1913), No. 1, pp. 44-63).—This reports measurements of cattle and sheep of different breeds and ages, also of Poitou asses. The relative value and measurements of each are discussed.

[Progress in live-stock breeding], F. P. MATTHEWS ET AL. (*Live Stock Jour. Almanac [London]*, 1913, pp. 121-206).—A series of articles by different authors, showing the general situation of the live-stock industry and in particular the conditions of the important British breeds in 1912.

The discussion of animal nutrition at Dundee, E. J. RUSSELL (*Sci. Prog. Twentieth Cent.*, 7 (1913), No. 27, pp. 413-436).—A report of a discussion of present-day problems in animal nutrition at the agricultural section of the British Association for the Advancement of Science, 1912. Abstracts are reported of the following papers:

The verdict of the bullock, W. Bruce (pp. 415-420).—This paper contains a report of experiments in feeding cotton cakes to sheep and bullocks, from which it appeared that composition and energy value did not entirely account for the results obtained.

The discrepancy between the results actually obtained and those expected from chemical analysis, F. G. Hopkins (pp. 420-423).—The author pointed out that our teaching concerning nutrition is too dogmatic and needs revision; also that the isodynamic law of Rubner holds within certain limits only as carbohydrates and fats are not physiologically equivalent.

Active constituents of grain, L. Hill (pp. 423, 424).—This discusses the necessity of taking into account the chemical nature of certain active substances acquired in small amounts.

An explanation of beri-beri, C. Funk (pp. 424, 425).—A brief report of the author's work on vitamin, a pyrimidin base analogous to thymine, which the author has isolated from rice polish, yeast, milk, and bran. It acted as a curative when administered to pigeons suffering from beri-beri.

More difficulties from the practical side, D. Wilson (pp. 425-428).—The author gives illustrations of the large error which occurs when feeding tests are based on the average coefficient of digestibility of feeding stuffs, and emphasizes the fact that the primary object of research on feeding values in Great Britain has not been to inform practical feeders how to construct their rations but how to increase the feeding quality of the home-grown feeds which form the main part of the rations.

Certain oil foods, Hendrick (pp. 428-430).—A report of a feeding test with calves. The lot fed on whole milk to the time of weaning made faster gains

than when oil substitutes were used. Cotton-seed oil and separated milk and cod-liver oil and separated milk were about equal in value as substitutes for whole milk. The cost of the cotton-seed oil was slightly less. The author advocates the use of the energy value in the comparison of feeding stuffs.

The magnitude of the error in nutrition experiments, R. A. BERRY (pp. 430, 431).—The advantage of applying the normal error to feeding experiments is illustrated.

A note of caution, CROWTHER (pp. 431–436).—In the author's opinion the starch value is the best method yet advocated for the comparison of feeding stuffs, and although not perfect he and Dr. Bruce advocate its use until some better method has been discovered. It was the general agreement among those who took part in the discussion that neither protein minimum, energy value, starch value, nor any other standard yet proposed for evaluating feeds has proved to be entirely satisfactory.

Information concerning the feeding of animals, VAN GODTSENHOVEN ET AL. (*Min. Agr. et Trav. Pub. [Brussels], Off. Rural, Avis aux Cult., 3. ser., 1911, No. 1–10, pp. 144*).—A discussion of the nutritive values of the common feeding stuffs in Holland, and methods of combining rations for live stock.

The influence of food upon fertility in stock, G. P. DARNELL-SMITH (*Rpt. Govt. Bur. Microbiol. N. S. Wales, 2 (1910–11), pp. 230–234*).—A review of investigations on this topic, which are summarized as follows:

"The greater productivity of domestic animals over their wild progenitors is due largely to their ready supply of nourishment. The production of too much fat by overfeeding reduces fertility. This applies to females in particular, and may apply to males in a lesser degree. The fertility of animals may be increased at the breeding season by an adequate supply of suitable nutriment. The control of fertility is to be gained by more rigid attention to diet."

The effect of establishing permanent pastures on the culture of grain and potatoes and upon systems of farm management in Central Germany, R. G. BRUCHHOLZ (*Mitt. Ökonom. Gesell. Sachsen, 1911–12, pp. 29–80*).—A discussion of climatic conditions and other factors affecting the cost of gains in young stock on pasture. There is a comparison of the income from staple crops, such as potatoes and grain, as contrasted with the income derived from permanent pasture.

Note on the chief fodder grasses of Indian forests, R. S. HOLE (*Indian Forester, 39 (1913), No. 2, pp. 69–81*).—Appended to a brief note on the nutritive value of grasses is a list of the chief fodder grasses of the Indian forests, together with a short bibliography.

The feeding value of the horse chestnut, S. J. M. AULD (*Jour. Soc. Chem. Indus., 32 (1913), No. 4, pp. 173, 174*).—Horse chestnuts were artificially dried, partially crushed, the shells removed, soaked in cold water over night, and then boiled for one-half hour. If the water is rejected and the residual material dried, partially husked, and reduced to a meal, a large part of the bitter principle is removed. The analysis of the meal is given as follows: Water 8.2 per cent, crude protein 9.3 per cent, ether extract 6.3 per cent, carbohydrates 64.2 per cent, crude fiber 9.5 per cent, and ash 2.5 per cent.

In a feeding trial with a calf, extending over 3 months, the meal was fed in amounts up to 5 lbs. per day with favorable results. A sheep was fed a ration of horse-chestnut meal for 3 weeks without injury, but it never liked the food and it was eventually withdrawn. It was also given to pigs, but it was so unpalatable that little of it was eaten.

The evolution of the cattle industry, H. GIBSON (*An. Soc. Rural Argentina, 43 (1909), Nos. 65, pp. 71–77; 66, pp. 33–37; 44 (1910), Nos. 67, pp. 75–78; 68,*

pp. 82-85; 69, pp. 123-126; 70, pp. 81-89; 71, pp. 13-19).—A historical account of cattle breeding in Argentina.

The origin of Argentine cattle, J. A. PILLADO (*An. Soc. Rural Argentina*, 44 (1910), Nos. 68, pp. 67-71; 69, pp. 119-122; 70, pp. 76-80; 71, pp. 34-39).—A historical and statistical account of the cattle industry in Argentina.

Crosses between Algau and African cattle, SPANN (*Deut. Landw. Tierzucht*, 17 (1913), No. 2, pp. 18-20; abs. in *Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 3, pp. 437, 438).—A report of crosses between Algau bulls and native red cows of Bechuanaland and Griqualand. The offspring proved to have the head characteristics of the Algau and to a large extent the hair color. The milking qualities were superior to that of the native cows.

Jersey-Angus cattle, W. PARLOUR (*Live Stock Jour.* [London], 77 (1913), No. 2625, p. 85).—A preliminary report of crosses between the Angus and Jersey breeds in an attempt to combine beef and dairy qualities and also to produce an animal adapted to the climate of the north of England. The calves of the first cross were black, with the exception of traces of Jersey color on the udder. The females were all polled, but the males usually developed scurs. The heifers at maturity proved to be good milkers.

Sheep breeding experiments on Beinn Bhreagh [Nova Scotia], A. G. BELL (*Manuscript from Beinn Bhreagh Recorder*, 10 (1912), pp. 368-386).—In a continuation of earlier work (*E. S. R.*, 20, p. 1173) the author describes how a race of 6-nippled ewes has been produced.

Deer breeding for fine heads, W. WINANS (*London*, 1913, pp. XII+105, pls. 2, figs. 37).—A description of several species of deer adapted to semi-domestication. The author discusses methods of feeding and care and the effect of abundant food on the development of horns. There are also brief notes on experiments in crossing the wapiti (*Cervus canadensis*), Altai (*C. canadensis asiaticus*), red deer (*C. elaphus*), and hangul (*C. cashmirianus*).

[European methods of feeding horses], J. ASHTON (*Breeder's Gaz.*, 62 (1912), Nos. 21, p. 1096; 22, p. 1153; 63 (1913), No. 4, p. 206, fig. 1).—An account of methods of feeding work horses in London and Paris.

Horse breeding, D. INCHAUSTI (*Bol. Min. Agr. [Buenos Aires]*, 14 (1912), No. 8, pp. 777-841).—A report of a study of types of horses in Europe and India, with special reference to the securing of a type suitable for export to Argentina.

Horse breeding in Prussia for the last 25 years, VON DETTINGEN (*Deut. Landw. Tierzucht*, 17 (1913), No. 14, pp. 162-164).—A brief résumé of the chief events in horse breeding in Prussia.

Hints to poultry raisers, H. M. LAMON (*U. S. Dept. Agr., Farmers' Bul.* 528, pp. 12, figs. 2).—This is a revision of Circular 206 of the Bureau of Animal Industry, previously noted (*E. S. R.*, 28, p. 173).

The carbohydrate metabolism in ducks, G. B. FLEMING (*Jour. Physiol.*, 45 (1913), No. 6, pp. xliii, xlv).—This is a preliminary report of experiments in which ducks were subjected to pancreatectomy and partial pancreatectomy. Adrenalin was also injected subcutaneously, and the respiratory quotient was determined in ducks with hyperglycæmia.

The results suggest that the carbohydrate metabolism of ducks is controlled by much the same mechanism as in the case of mammals. There was a difference between pancreatic and adrenalin hyperglycæmia, for in the former the respiratory quotient remained low in spite of carbohydrate intake, whereas in the latter there was a distinct rise.

Ostrich breeding, A. MENEGAUX (*Agr. Prat. Pays Chauds*, 12 (1912), Nos. 111, pp. 441-459; 112, pp. 22-30; 113, pp. 117-131; 114, pp. 203-215; 116, pp. 380-394; 117, pp. 467-481; 13 (1913), Nos. 118, pp. 19-35; 119, pp. 112-129; 120, pp. 196-214, figs. 23).—These articles treat of the different varieties of ostriches, the anatomy of the ostrich feather, the down of the ostrich, the market for plumes, and the methods of breeding in different countries, and describe the terms applied to commercial plumes.

Preservation of eggs by coating with paraffin (*Agr. Gaz. N. S. Wales*, 21 (1910), p. 990; *Rpt. Govt. Bur. Microbiol. N. S. Wales*, 2 (1910-11), p. 209).—A brief report is given of experiments in preserving eggs by sealing with gelatin and with a mixture of paraffin and vaselin.

At the end of 12 months those treated with gelatin were not well preserved and had evaporated to a large extent. The paraffin-treated eggs, however, neither evaporated nor decomposed. The white was quite fluid, and although the yolk membrane was easily ruptured the yolk was turned out in an unbroken state. When boiled these eggs had an old taste, but otherwise were satisfactory. The control eggs, which received no treatment, had become putrid and most of them had become dry through evaporation.

DAIRY FARMING—DAIRYING.

Dairy terminology, B. MARTINY (*Milchw. Zentbl.*, 42 (1913), No. 2, pp. 34-39).—A list is given of some synonymous dairy terms, with a brief discussion of the exact meaning of some of the more important ones.

Report of the activities of Alnarp Agricultural and Dairy Institute and Agricultural School, 1911, H. L. O. WINBERG (*Malmö*, 1912, pp. 59+32).—This report includes accounts of the educational work of the year at the institutions given, and also the administrative report of the institute and the farm report of Alnarp estate.

Report on further experiments on the feeding of dairy cows at Offerton Hall, F. P. WALKER (*Durham County Council, Ed. Com., Offerton Bul.* 4, 1913, pp. 40).—In 2 experiments lasting 7 weeks each cows fed soy-bean cake produced slightly more milk than those fed cotton-seed cake. In 2 other tests of 8 weeks each cows fed concentrates consisting of soy-bean cake, barley meal, and corn meal in the form of "crowdy," a stiff porridge, produced practically the same amount of milk and fat as those fed the same concentrates dry, and the expense and trouble of making it is therefore considered probably unwarranted.

In 2 other 8 weeks' tests cows fed Sudan durra, or Kafir corn meal, produced practically the same amount of milk and milk fat as those fed corn meal.

Records of 24 cows milked 3 times daily for 2 days showed that 46 per cent of the milk was yielded at 6 a. m., 33 per cent at noon, and 21 per cent at 6 p. m., while 10 cows milked twice daily yielded 48 per cent in the morning and 52 per cent in the evening. The poorest milk with 3 milkings was at 6 a. m. and the richest at noon. With 2 milkings the richest milk was obtained in the evening.

Biological examination of the quality of milk, S. PARASCHTSCHUK (*Milchw. Zentbl.*, 42 (1913), No. 3, pp. 65-69, figs. 9; *abs. in Circam. and Milk Plant Mo.*, 1 (1913), No. 7, pp. 30, 31).—The quality of milk was tested by studying the development of 5 races of lactic acid bacteria, with the following results:

The Danish streptococci gave an excellent curd in consistency and taste. They required fresh milk and did not develop in milk not thoroughly chilled immediately after milking and kept cold. A small diplococcus, which the author brought from Jaroslav, Russia, gave a fine, thin curd, but its chief dis-

tion is the retention of its virulence for 8 months, or twice as long as the other races. Guenther's diplococci gave a sweetish curd, of no very solid consistency. Both these types require a good quality of milk, although they were developed in milk in which the Danish streptococci grow poorly. A type of Russian lactic streptococci gave a thick, tough curd, and developed in milk of inferior quality. It differed from the Danish by the frequent formation of large, elongated twin cells. The Bulgarian bacillus, distinguished by great endurance in unfavorable conditions, developed in bad milk, where none of the other types were able to thrive. The addition of a large amount of soda did not affect its development.

The method of using these types for testing the quality of market milk is given in detail.

Researches on bacteria in milk, F. TIDSWELL (*Rpt. Govt. Bur. Microbiol. N. S. Wales*, 2 (1910-11), pp. 186-191).—From udder milks there were isolated by ordinary agar plating 11 species of cocci and 2 species of bacilli. By similar methods there were isolated from market milk 30 species of organisms, comprising 16 bacilli, 10 cocci, 2 molds, and 2 yeasts. This indicates that most of the organisms other than cocci did not come from the mammary gland.

Data of samples taken from the dairy and on the market are summarized as follows: "'Fermenters,' in the form of coli-form bacilli of presumptively fecal origin, were regularly found in the milk and apparently persisted throughout the pasteurization, cooling, etc. 'Digesters,' in the form of chromogenic and nonchromogenic bacteria and molds of presumptively aerial or terrestrial origin, of digestive or putrefactive character, were present variably, suggesting repetition of contamination rather than resistance to treatment. 'Fermenters,' in the form of lactic species, were not absolutely, but pretty constantly, present and seemed to be capable of resisting the pasteurization."

Feed, and flavor and texture of cheese, T. A. UBBELOHDE (*Dairy*, 25 (1913), No. 291, p. 74).—From experience and observation the author summarizes data on the effect of feed upon the quality of cheese.

Some feeds affect the texture and others the flavor of cheese. In handling the curd the effect of certain feeds on the texture can not be entirely overcome in the attempt to produce a good waxy cheese, although a fairly good cheese may be made. The most troublesome feeds are those containing a large amount of oily or fatty matter. The cheese made from the milk of cows that had eaten acorns was found to develop a sharp acid flavor when about 4 weeks old, although its texture was good.

Chemical composition of Portuguese cheese, KLEIN (*Milchw. Zentbl.*, 42 (1913), No. 1, pp. 4-7).—Analyses are reported of 104 samples of cheese made from the milk of sheep and goats.

Whey lemonade, R. BURRI (*Milchw. Zentbl.*, 42 (1913), No. 2, pp. 46-49; *Molk. Ztg. [Hildesheim]*, 27 (1913), No. 5, pp. 81, 82).—The method of making whey lemonade is given, and the analyses of 2 samples reported.

The composition varies according to the method of manufacture. The samples analyzed by Köstler and Burri gave the following percentages: Acidity after removing CO₂ from 18.2 to 28.6 per cent; nitrogen as protein, 0.2 per cent; cane sugar, 5.8 to 5.9 per cent; milk sugar, 1.37 to 3.29 per cent; and ash, 0.47 to 0.64 per cent. The liquid is clear and keeps for several weeks. It is of a greenish color, which is lost if exposed to the action of light. The taste resembles that of milk which has been overheated.

The casein industry, J. PEDERSEN (*New Zeal. Dept. Agr., Dairy Div. Bul.* 23, 1912, pp. 12; *N. Y. Produce Rev. and Amer. Cream.*, 35 (1913), Nos. 14, pp. 622, 623; 16, pp. 702, 704).—A report of a study of the casein industry in Europe.

Artificial milk, L. GERLEI (*Milchw. Zentbl.*, 42 (1913), No. 2, pp. 49-52).—Brief notes on the nature of some compounds used as substitutes for milk are given.

VETERINARY MEDICINE.

A new treatise on general pathology, compiled by C. BOUCHARD and G. H. ROGER (*Nouveau Traité de Pathologie Générale. Paris, 1912, vol. 1, pp. XII+909, figs. 53*).—This is the first edition of this work, and is edited by C. Achard, J. Bergonié, P. J. Cadiot, P. Courmont, M. Duval, P. Mulon, A. Imbert, J. P. Langlois, P. Le Gendre, F. Lejars, P. Le Noir, T. Nogier, H. Roger, and P. Vuillemin. It is wholly distinct from the pathology published by Bouchard and Roger from 1895-1905, and is arranged on an entirely different plan.

Results of research in the general pathology and pathologic anatomy of man and animals, edited by O. LUBARSCH and R. OSTERTAG (*Ergeb. Allg. Path. Mensch. u. Tiere*, 15 (1911), pt. 1, pp. IX+823, figs. 61).—The contents of this volume are as follows: The Proteolytic Leucocyte Ferment and its Antiferment, by P. Wiens (pp. 1-81); Loss and Changes in the Functions of the Thyroid Gland as a Cause of Disease, by E. Bircher (pp. 82-377); Hermaphroditism Considered from a Morphological Standpoint, by E. Sauerbeck (pp. 378-429); About Embryonal Tissue Anomalies and their Pathologic Significance in General, Especially Those of the Male Sexual Apparatus, by R. Meyer (pp. 430-649); Double Formations in Man and Animals, by H. Hübner (pp. 650-796). A large bibliography is appended in each case.

Physical theory of immunity and its experimental basis, O. GENGOU (*Jour. State Med.*, 20 (1912), Nos. 2, pp. 65-91; 3, pp. 141-172).—The author believes that although the physical theory of immunity formulated by Bordet in 1899 does not yet give an absolutely precise explanation, demonstrated beyond doubt, of all the characteristics of the reactions which take place between the antigens and the antibodies, "it is none the less true that, founded from the beginning on experimental facts such as the phenomenon of Bordet and Danysz, it is still the only one up to this day which has furnished from these facts a satisfactory explanation, whereas the theories which have been propounded from their consequence have not been able to withstand criticism or experimental verification.

"As the knowledge of the phenomena of absorption becomes more precise and the mechanism of humoral reactions has been more thoroughly investigated, the number of facts which can be reconciled with Bordet's theory has grown increasingly, while no phenomenon has shown itself to be formally contradictory to it, and its experimental bases have been progressively fortified and developed. Whether it is a question of the quantitative relations in which the antibodies unite with the antigens, or of factors which are opposed to this union, whether it is a further question of the reversibility or the consolidation of this phenomenon, Bordet's theory shows itself to be in harmony with the facts and without restraint and new hypothesis. It is to be hoped that such will be the case, that each experimentalist investigating the mechanism of the phenomena of immunity can put to the best advantage his researches on the advances realized in the study of molecular adhesion and the reactions in which colloidal substances take part."

The antigenic properties of split products of casein, F. P. GAY and T. B. ROBERTSON (*Jour. Expt. Med.*, 16 (1912), No. 4, pp. 470-478).—Chemically pure casein and some of its split products were examined in regard to their antigenic properties.

"Casein and paranuclein have distinct antigenic properties, particularly as shown by their ability to sensitize guinea pigs for subsequent anaphylactic

intoxication by each other or by milk. This sensitizing ability and a corresponding ability to intoxicate are indistinguishably equivalent, under the conditions employed. On immunizing rabbits by repeated injections of paranuclein or of casein and subsequently testing their sera for precipitins and fixation antibodies, it was found that casein apparently produces them much more readily, giving an antiserum that reacted (fixation) in very high dilution with casein (0.000,000,1 of a 1 per cent solution), but much less strongly with paranuclein. Only 1 of 2 antiparanuclein sera showed the presence of antibodies to paranuclein by the delicate fixation reaction, and that in relatively small amounts. The 2 antibodies to casein and to paranuclein are, in the case of casein quantitatively, and in the case of paranuclein absolutely, specific.

"A solution of the products of complete peptic digestion of casein fails to sensitize to paranuclein and gives no fixation reaction with an anticasein or antiparanuclein serum. It intoxicates animals sensitized to paranuclein but no more markedly than it does normal animals. It also fails to show specific intoxication in an animal that has been sensitized by the same substance.

"The amino acids, glutamic acid, and leucin, the principal components of their kind in casein, and in the same proportion therein present, likewise failed to show antigenic properties. They do not sensitize animals to milk intoxication or to intoxication by themselves, and likewise failed to produce precipitins in rabbits in a preliminary experiment.

"These experiments are regarded as a fairly systematic analysis of the antigenic properties of split products of a single protein. They are analogous to, though less complete than, the work of Wells on egg white. They seem to present the additional advantage of dealing with what is probably the only protein certainly known chemically, and in its purest form."

Normal hemagglutinins in human milk and their transference from the mother to the child, J. VON ZUBEZYCKI and R. WOLFSGRUBER (*Deut. Med. Wchnschr.*, 39 (1913), No. 5, pp. 210-212).—Normal hemagglutinins are present in woman's milk to a greater extent directly after parturition, but the agglutination obtained with different corpuscles varies. The milk from primipara contains more hemagglutinins than multipara and retains them longest. Hemagglutinins are not present in the serum of sucklings up to the fourteenth day.

Autotherapy, C. H. DUNCAN (*Lancet Clin.*, 106 (1911), No. 19, pp. 472-481; *Amer. Vet. Rev.*, 41 (1912), No. 5, pp. 516-544).—This is a method of curing sepsis "by placing in the mouth the fresh autogenous toxic substances developed during the course of the disease. The therapeutic value of autogenous pus, given in this manner, is greater than the autogenous vaccine prepared from a pure culture of the offending micro-organism by the method now in vogue."

The data reported deal with human diseases. See also a previous note by Mangan (*E. S. R.*, 27, p. 684).

Feeding maize, and hypersusceptibility against extracts of maize, D. CESA-BIANCHI and C. VALLARDI (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 15 (1912), No. 4-5, pp. 370-408).—This investigation has particular reference to pellagra and shows that maize extracts, when injected intravenously, always produce a certain amount of toxemia. The toxicity, however, not only varies with the method of preparing the extract, but also with the variety of maize used in the test. Much depends upon the degree of heat, and whether the extract has been filtered and exposed to light. Extracts from spoiled maize are usually more poisonous than those prepared from good maize; water extracts are more toxic than alcoholic or ethereal extracts. The pathologic effects produced as the result of injecting the maize intravenously strongly resemble those found in serum anaphylaxis, or where death is produced by injecting peptone.

Corn is not considered a palatable food for guinea pigs, and animals receiving this food entirely, die. Feeding maize for a time or feeding it in connection with other feeds over a long period of time will cause falling out of the hair and lesions in the gastro-intestinal canal and kidneys. Spoiled maize is borne by guinea pigs as well as sound maize. All animals fed with maize after a time showed a hypersusceptibility to maize extracts.

In regard to the detection of erysipelas bacteria in putrefied organs and in the animal body after vaccinating by the Lorenz method, W. WAGNER (*Untersuchungen über den Nachweis von Rotlaufbacillen in faulen Organen und im Tierkörper nach der Lorenz'schen Schutzimpfung. Inaug. Diss., Univ. Bern, 1910, pp. 38*).—If the putrefactive process has not proceeded too far, there is no difficulty encountered in detecting the presence of the *Bacillus erysipellatis* in the organs of the animals affected with the disease. The *B. erysipellatis* was found present in a viable condition 13 days after vaccination. On the fourteenth day the organisms were probably destroyed because they could not be noted in the blood, and after the eighteenth day the bacteria had entirely vanished from the body. According to this, if the disease develops after the eighteenth day, it can not be attributed to the use of living cultures for vaccination purposes.

Salvarsan in the treatment of surra in horses, dogs, and rabbits, J. D. E. HOLMES (*Mem. Dept. Agr. India, Vet. Ser., 1 (1913), No. 2, pp. 89-148; abs. in Jour. Compar. Path. and Ther., 26 (1913), No. 1, p. 91*).—In the first part of this paper (pp. 89-107), which deals with salvarsan in the treatment of surra in horses, a report is given of 17 cases treated by a single intravenous injection of salvarsan, of 2 cases by 3 injections of salvarsan at one day's interval and also at one week's interval, and of 4 cases by a combined treatment of salvarsan and arsenious oxid. The author finds that in horses the toxic amount of salvarsan injected intravenously is approximately at the rate of 0.01 gm. per pound of body weight. Individual susceptibility to salvarsan exists. An intravenous injection of salvarsan is followed by a disappearance of trypanosomes from the circulation for periods varying from 6 to 37 days. The relation between the amount of salvarsan injected and the period of absence of parasites is neither regular nor definite.

In 3 cases a cure followed a single intravenous injection. The curative property of salvarsan is not in exact proportion to the amount of drug administered. By repeated administration a tolerance to salvarsan is established. One of 2 ponies which received 3 injections of salvarsan at intervals of one day was cured. Three intravenous injections did not give results superior to those following single injections. The administration of a large dose of arsenious oxid, followed 24 hours after by an intravenous injection of salvarsan, produced no better results than a single dose of either.

The second part of this paper (pp. 109-144) relates to the salvarsan treatment of surra in dogs; the third part (pp. 145, 146) to salvarsan treatment of surra in rabbits. A list of references to the literature on the subject is appended.

The specificity of the immunity reactions with various trypanosomes, H. BRAUN and E. TEICHMANN (*Arch. Schiffs u. Tropen Hyg., 16 (1912), Beiheft 4, pp. 141-147; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 14, pp. 343, 344*).—Continuing previous work, in which it was found that with killed dried trypanosomes obtained from mice affected with trypanosomiasis it was possible to prepare an active immune serum by injecting the substance into rabbits, a closer study of the specificity of this reaction was made, and in this connection active and passive immunizing tests, as well as

complement fixation tests, were conducted. The trypanosomes examined were from cases of dourine, nagana, mal de caderas, gambiense, and congolense.

Among the various strains of trypanosomes no differences in passive or active immunizing powers were noted. It was, however, discovered that mutual antigens could not be prepared between gambiense and nagana or dourine trypanosomes. The probability exists that some of the strains examined were serum-proof. With the complement fixation test qualitative differences could not be noted between nagana and dourine trypanosomes. Serum-proof and nonserum-proof strains of the same kind of trypanosomes show no differences with the complement fixation test.

The complement fixation test carried on according to Bordet's and Gengou's specifications is recommended.

Studies on the biochemistry and chemotherapy of tuberculosis.—II, Intravital staining of tuberculous guinea pigs with fat-soluble dyes, H. J. CORPER (*Jour. Infect. Diseases*, 11 (1912), No. 3, pp. 373-387).—Continuing work previously noted (E. S. R., 28, p. 584), dye-staining fats when administered to tubercular guinea pigs under various conditions were not noted in the tubercles of these animals. This favors the view that the fats contained in the tubercle are derived from the intracellular fats of the tissues which form the tubercle and not from food or transported storage fats. Tubercle bacilli contained within the tubercle did not take the stain.

When animals were saturated with the common fat stains Sudan III, Scarlet Red, Sudan Yellow, Sudan Brown, and Nile Blue Sulphate, no effect on the course of the tubercular process in the guinea pig was noted. None of the dyes was found to stain any but depot or storage fats, and no harm to the guinea pigs was noted after feeding them the dyes for over 200 days.

"Subcutaneous or intraperitoneal injection of fat dyes dissolved in fats and oils is much less effective in staining the depot fats than is feeding the stained fats.

"Nile Blue Sulphate is toxic when given by injection, and when fed it did not cause staining of the fat tissues. Sudan Yellow also failed to stain the fat tissues, and is excreted by the kidneys. Sudan Brown has little or no effect on the fats. Scarlet Red gave a more intense coloration than Sudan III but in general the effects are about the same."

It was also noted that the fat stains do not pass through the placenta to the fetus, or at least the fat of the embryo guinea pigs from stained mothers is not stained. This corroborates the results of the Gages (E. S. R., 20, p. 1170), Mendel (E. S. R., 21, p. 665), and Daniels. The embryos examined showed extremely fatty but unstained livers. Fat dyes did not pass into the milk of lactating guinea pigs.

Studies on the biochemistry and chemotherapy of tuberculosis.—III, The lipase of *Bacillus tuberculosis* and other bacteria, H. G. WELLS and H. J. CORPER (*Jour. Infect. Diseases*, 11 (1912), No. 3, pp. 388-396).—Killed bacteria were tested in regard to their lipolytic power upon various esters and fats.

Typical lipolytic enzymes were noted even in those organisms which cause no visible splitting of fats in plate cultures. "Bacteria causing visible fat splitting in plate cultures (*B. pyocyaneus* and *Staphylococcus pyogenes aureus*) are much more actively lipolytic than bacteria which do not give positive results by this method (*B. coli communis*, *B. dysenteriae* [Flexner], *B. tuberculosis*). All these 5 organisms cause hydrolysis of olive oil, ethyl butyrate, and glycerol-triacetate. The order of hydrolytic activity is the same for each of the 3 esters, being as follows: *Staphylococcus*, *B. pyocyaneus*, *B. coli*, *B. dysenteriae*, and *B. tuberculosis*. Presumably the same enzyme attacks all 3 esters. *B. tuberculosis* is probably less actively lipolytic than the other bacteria tested."

The bacterial lipases resemble the lipases of mammalian tissues in so far as their activity is inhibited by very small amounts of sodium chlorid.

The so-called "Much granules" in tuberculosis, I. VAN GIESEN (*Collected Studies Research Lab. Dept. Health, City N. Y.*, 6 (1911), pp. 265, 266).—The author believes that to Much's granules can not be attached the importance which is usually attributed to them, but that the conversion of acid-fast types of tubercle bacilli to nonacid-fast types has not been given due consideration.

The vitality of tubercle bacilli proven by inoculation and inhalation, P. CHAUSSÉ (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 9, pp. 486-489; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, 11, Ref., 6 (1912), No. 6, pp. 631, 632).—In experiments made with human sputum and guinea pigs, much difference was noted in the virulency whether the tubercle bacillus was introduced into the body by inhalation or by inoculation. In the case of inhalation the virus was destroyed much quicker than when given by inoculation, if the sputum was dried at high temperatures.

It is furthermore pointed out that many organisms inhaled get into the lungs and are destroyed much quicker by the phagocytes, especially if the virulence of the organism is low. The bacteria inoculated at a given area render that area a general focus of infection, and generally regulate the outbreak of an infection. The length of time in which an organism is viable in dried sputum is sufficient to consider sputum a dangerous element.

Bovine tuberculosis, R. BIDART (*Trab. 4. Cong. Cient. Santiago de Chile*, 15 (1908-9), pp. 5-76, pls. 11).—This deals with the diffusion, symptoms, frequency of the lesions, diagnosis, and prophylaxis of tuberculosis, with special reference to the conditions in Argentina. The relation of tuberculosis in the bovine to the disease in man is also considered.

Etiology of laryngeal and tracheal tuberculosis in slaughtered animals and their significance for meat inspection, E. ENTRESS (*Beitrag zur Aetiologie der Larynx- und Tracheatuberkulose bei den Schlachtthieren und ihre Bedeutung für die Fleischschau. Inaug. Diss., Univ. Bern*, 1911, pp. 28, pls. 3).—The author believes that tuberculosis of the larynx and trachea (abscesses and tumors) occurs more frequently than is generally supposed.

Clinical and bacteriological diagnosis of open pulmonary tuberculosis in bovines, A. J. WINKEL (*Ueber die klinische und bakteriologische Diagnostik der offenen Lungentuberkulose beim Rinde. Inaug. Diss., Univ. Bern*, 1910, pp. 70).—For diagnosing this condition the following methods are recommended: Ostertag's (noting the moist râles), Ostertag's modification, tracheotomy, and the Neuhaus operation. For the more marked cases the usual clinical methods can be applied, and, when necessary, the Röberts method (holding the nares shut for a few moments, which will create dyspnea and irritate the mucous membrane), and the method of forced movement (which increases respiration and makes the râles more evident). The bacteriological examination and the various tuberculin reactions are used as aids for diagnosing this condition.

A contribution in regard to the reliability of the various tuberculin reactions, H. TALLGREN (*Skand. Vet. Tidskr.*, 2 (1912), No. 3, pp. 61-73; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, 11, Ref., 5 (1912), No. 14, pp. 356, 357).—This is a study of the value of the intracutaneous, subcutaneous, and ophthalmic reactions with a herd consisting of 71 cattle. About 7 months before the tests were made, all reacting cattle had been slaughtered and the barns thoroughly disinfected.

In these tests the subcutaneous reaction gave positive results in 16 cases and 6 atypical reactions, and the intracutaneous test gave 19 positive and 19 atypical reactions. Thirty-seven cases gave an ophthalmic reaction. In all 45 animals reacted when tested with one or the other reaction, but only 11 gave a

typical reaction with all the methods. Forty-seven animals were slaughtered, of which 5 gave no reaction at all and showed no lesions of tuberculosis. Another animal, which reacted to all tests, also showed no lesions. No animal gave the subcutaneous reaction alone.

The difficulties encountered in the diagnosis of tuberculosis by tuberculin, A. ELOIRE (*Rec. Méd. Vét.*, 90 (1913), No. 2, pp. 61-66).—A description of cases in which difficulties were encountered in pronouncing animals tubercular on the basis of the tuberculin test.

The limitations of the tuberculin test, E. G. HASTINGS (*Amer. Vet. Rev.*, 42 (1913), No. 4, pp. 384-398).—This article discusses especially the points where the tuberculin reaction may be misinterpreted, and also the difficulty of eliminating tubercular cattle from a herd on the basis of the test.

Tuberculosis, J. MCFADYEAN (*Jour. Roy. Agr. Soc. England*, 71 (1910), pp. 27-45).—This deals with the hereditary factors concerned in the causation of tuberculosis and their elimination from herds.

Immunization against hemorrhagic septicemia, J. R. MOHLER and A. EICHORN (*Amer. Vet. Rev.*, 42 (1913), No. 4, pp. 409-418).—Previously noted from another source (*E. S. R.*, 28, p. 281).

Hemorrhagic septicemia in the sheep in Scotland, J. P. MCGOWAN and T. RETTIE (*Jour. Path. and Bact.*, 17 (1913), No. 3, pp. 423-425; *Vet. Jour.*, 69 (1913), No. 453, pp. 104-107).—The authors suggest that at least some of the cases which go by the name of "braxy" may in reality be cases of this disease (pasteurellosis).

Contagious agalactia of the sheep and of the goat, H. CARRÉ (*Ann. Inst. Pasteur*, 26 (1912), No. 12, pp. 937-972, pls. 3; *abs. in Jour. Compar. Path. and Ther.*, 26 (1913), No. 1, pp. 55-59).—Brief reference is first made to the literature relating to this disease, the majority of the references being the work of Italian authors. In some districts the disease is an actual scourge, especially in the mountainous districts. It is of much economic importance, as it occasions great loss of condition and renders the animals unsuitable for slaughter, and in sheep there is atrophy of the mammary gland. Acute and chronic forms of the disease are recognizable and there are symptoms of a general and of a local nature.

The author finds that, contrary to the opinion held by other authors, infected udders are capable of secreting for months a liquid of constant virulence, even up to the time of total atrophy of the gland. The disease is contagious only when "open" lesions are present. The lachrymal secretion from diseased eyes is infective even though there be no actual ulceration. The principal method of infection is by ingestion. A large amount of the virus in a state of purity can be obtained by producing pleurisy experimentally. The serum of hyperimmunized animals has protective properties. Serovaccination as practiced at the laboratory promises to be of great prophylactic value.

About the precipitation reaction in hog erysipelas, M. ISABOLINSKY and B. PATZEWITSCH (*Centbl. Bakt. [etc.]*, 1. Abt., *Orig.*, 67 (1912), No. 4, pp. 284-288).—Ascoli's reaction, using a specific erysipelas serum, is specific, but all erysipelas sera do not give uniform reactions. The reaction can be employed where the organs are in a state of putrefaction and is even more specific. The most definite reaction is obtained with the spleen and heart. Disinfecting agents do not affect the results providing they are carefully removed from the infected material.

A case of pustular dermatitis and pyemia in the horse, caused by *Micrococcus tetragenus*, L. MONGRELL (*Ann. Méd. Vét.*, 62 (1913), No. 3, pp. 151-154; *abs. in Vet. Rec.*, 25 (1913), No. 1293, pp. 650, 651).—A report of a case at Brussels, the pus of which in addition to staphylococci showed the presence of

M. tetragenus. The animal died on the sixteenth day without having shown the least elevation of temperature.

The cultivation of the virus of fowl plague, K. LANDSTEINER and M. BERLINER (*Centbl. Bakt. [etc.]*, 1. Abt., *Orig.*, 67 (1912), No. 3, pp. 165-168; *abs. in Jour. Compar. Path. and Ther.*, 26 (1913), No. 1, pp. 60, 61).—The results obtained in these experiments confirm the finding of Marchoux (*E. S. R.*, 20, p. 1191) that multiplication actually occurs in the cultures. It remains to be determined through how many generations the virus can be cultivated.

A study of polyneuritis gallinarum—a fifth contribution to the etiology of beri-beri, E. B. VEDDER and E. CLARK (*Philippine Jour. Sci., Sect. B*, 7 (1912), No. 5, pp. 423-461, pls. 11).—A number of conclusions concerning the relation between diet and beri-beri are drawn from the results of this study of polyneuritis in fowls, caused by a diet of polished rice, which demonstrated the similarity of the two diseases.

Both are the result of an exclusive diet which is deficient in some substance that is essential for the normal metabolism of nervous tissue. It was observed that the addition of meat, legumes, or rice polishings to a deficient diet, and a diet of potatoes prevented polyneuritis in the fowls.

RURAL ENGINEERING.

Duty of water investigation (*Bien. Rpt. State Engin. Idaho*, 9 (1911-12), pp. 90, figs. 4).—From the results of 3 years' investigations of the duty of water for irrigation in Idaho, as conducted by D. H. Bark under a cooperative agreement between the State of Idaho and this Office, the following conclusions are drawn:

"The duty of water depends upon a variety of factors, which are in the order of their importance (a) character of soil and subsoil; (b) climatic conditions; (c) the fertility of the soil; (d) diversification of the farm crops; (e) use of rotation; (f) preparation of the land; (g) kind of crop; and others of lesser importance.

"The duty for projects planted to diversified crops on the average clay loam soils of south Idaho should be sufficient, so that 2 acre-feet per acre may be retained on the land. Very impervious soils or shallow soils require slightly more water than deep medium soils. A tight impervious subsoil that roots can penetrate increases the duty. More water is required where porous subsoils exist. Gravelly soil may require 2 or more times as much water as the medium soil, the amount depending upon the porosity of the soil, the distance water is flooded, and the preparation of the land for irrigation. As much as 80 per cent of the water applied to gravelly soil is sometimes lost to the use of the crops from deep percolation. Gravelly soils should be irrigated by flooding large heads of water short distances.

"Cultivated crops, all other things being equal, require less water than uncultivated crops. Winter grains require less water than spring grains. The time of application has a decided effect upon the yield of grain. Alfalfa, clover, and pasture require almost exactly twice as much water on the same soil as the grains. An average of approximately 20 per cent of the amount applied is wasted from grain and alfalfa on the clay loam soils. Diversification of crops greatly increases the duty.

"Very little water is required by a project either earlier than May or later than August. The need for water is not constant during the season for a project with diversified crops; about 1 per cent of the season's supply is required during April, 16 per cent during May, 32 per cent each month during June and July, 16 per cent during August, and 2.5 per cent during the first half of September, after which there is very little need for water. . . .

"Rotation systems increase the duty and have many other advantages. Most canals divert more water than is actually required, both early and late in the season.

"The amount of water that will produce the largest yield of a certain crop, on a certain soil, is not always the economic duty. The value of land, the cost of water, the value of the crops produced, and the cost of producing them, as well as the amount of water that will produce the largest yield, must all be taken into consideration when determining the economic duty for any project.

"The expression of seepage losses as per cent per mile is misleading. Seepage losses should be expressed as the unit of loss per unit of area of canal bed per unit of time. Losses in medium soil range from 0.5 of a cubic foot to 1.5 cu. ft. per square foot of canal bed per 24 hours. Evaporation losses for canals are usually less than 1 per cent of the total loss. Losses are extremely high in farm laterals carrying 1 second-foot and less. Canals should be kept full of water and should be designed with as small a wetted perimeter as possible in comparison to the carrying capacity. Porous irrigated land above a canal may cause it to gain instead of to lose. Dikes in a canal section, or excessive velocities, increase seepage losses."

The flow of water in artificial channels: Clean pipes, W. H. ECHOLS (*Univ. Va., Bul. Phil. Soc., Sci. Ser., 1 (1912), No. 10, pp. 243-265, pl. 1, fig. 1*).—Inasmuch as in actual practice a certain form of construction and material accompanies certain ranges of diameters in water pipes the author determines an expression for the coefficient of resistance to flow adapted to the whole group as a function of the velocity and mean radius, using a theoretical assumption as to the form of the function of the velocity and mean radius and the constants determined from several hundred experiments on the flow of water in pipes of copper, brass, tin, zinc, lead, glass, wood, tile, cast and wrought iron, riveted iron, and cement.

For comparative purposes the results of 400 other experiments are given in tabular form, arranged according to increasing diameters and velocities, and showing the loss of head per 1,000 ft. and the experimental constants obtained in each case by the above formula and by the formulas designed by various authorities.

Irrigation by pumping in western Kansas, F. D. COBURN (*Mo. Weather Rev., 41 (1913), No. 1, p. 81*).—This article reviews the development of irrigation by pumping from both deep and shallow wells in the valleys and uplands of western Kansas. It states that in the Arkansas River Valley from Garden City to Syracuse many shallow well pumping plants are in operation or being installed. The depth to water in this valley is from 8 to 10 or 15 ft. It also states that the uplands, which comprise by far the greatest acreage, can be profitably irrigated by deep well pumping and that this practice promises by far the greatest possibilities.

"The developments and experiences of the past 18 months seem to demonstrate conclusively not only that water is available in western Kansas in immense quantities from a sort of subterranean lake, but that it may be successfully and economically raised for irrigating quite extensive areas."

Irrigation practice, with special reference to fruit growing in the Northwest, W. L. POWERS (*Portland, Oreg., 1912, pp. 68, pls. 4*).—This pamphlet deals with the movement of ground water, losses in soil moisture, measurement, distribution, application, and duty of water, irrigation pumping, irrigation of orchards and special crops, irrigation institutions, and cost and profits of irrigation.

Irrigation experiment, AUGSTIN (*Mitt. Deut. Landw. Gesell., 28 (1913), No. 7, pp. 100-103*).—A year's test was conducted on a German farm of a system of

supplemental irrigation by spraying. The system consisted of an engine-driven centrifugal pump discharging 320 gal. of water per minute into 1,800 ft. of movable 4 in. distribution pipe. Three sprays, each covering an area of 4,300 sq. ft. were moved from place to place on carts operated by windlass and wire cable. The entire system cost about \$3,200 and water was applied at a total cost of 1.75 cts. for each 200 gal., or about \$21 per acre-foot.

The rainfall in this locality between April and September was about 10 in. during which season 1.2 in. of water was applied to rye, barley, and potatoes to supplement the rainfall. The increase in the crop of rye and barley yielded a net profit of 6 cts. and the potatoes a net profit of 7 cents for each cubic meter of water applied.

The results in general are considered favorable to the profitability of spraying irrigation on small or medium sized plats of ground. It is concluded that several improvements may be made to reduce the cost of the plant and of applying the water.

Porto Rico irrigation service, J. A. WILSON (*War. Dept. [U. S.], Ann. Rpt. Governor P. R., 12 (1912), pp. 159-178*).—This report covers the operations and expenditures on the irrigation projects of Porto Rico for the fiscal year ended June 30, 1912.

Irrigation in Catalonia and Aragon, H. H. MORGAN (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 79, pp. 81-84*).—This reports the present status of irrigation and irrigation works in these districts of Spain.

It is stated that only about 6 per cent (3,088,750 acres) of the total cultivated area of Spain is under irrigation. Of this, 741,300 acres are included in Catalonia, 247,100 acres being irrigated by canals, and the remainder by means of trenches, pumping stations, or artesian wells. Existing and proposed irrigation works in the 2 districts are described, and it is estimated that the construction of proposed works will cost \$28,932,181, that the annual value of crops in the zone of the proposed work will amount to \$18,000,000, and that the land will be worth \$81,000,000.

Fifth biennial report of the state engineer of North Dakota, T. R. ATKINSON (*Bien. Rpt. State Engin. N. Dak., 5 (1911-12), pp. 127*).—This reports on irrigation and irrigation works, drainage and drainage works, coal mines and coal mine inspection, the design and construction of county roads and bridges, and the design and construction of waterworks and sewers for state institutions, including a financial report and a large amount of tabulated data.

Proceedings of the fifth annual drainage convention held at Raleigh, N. C., compiled by J. H. PRATT (*N. C. Geol. and Econ. Survey, Econ. Paper 31, 1912, pp. 56, pls. 6*).—This pamphlet contains the proceedings of this convention, and includes papers on the reclamation of swamp lands, by M. V. Richards; the drainage of Haarlem Lake, Holland, by C. G. Elliott; North Carolina drainage bonds, by M. W. Thompson; suggested changes in the North Carolina drainage law, by L. Brett; the need of drainage engineers, by G. H. Hill; and the use of dynamite in connection with drainage, by J. H. Squires.

The White Plains road experimental pavements, W. H. CONNELL (*New York, 1911, pp. 47, pls. 28*).—Experiments were conducted with a view to determining by a service test a suitable medium-priced pavement for country roads and parkways. The experimental pavements consisted of 18 sections, ranging in length from 100 to 350 ft. with a width of 21 ft. Fourteen of these sections comprise a bituminous pavement group, and 2 of these consisted of a wearing surface of broken stone and sand with an asphaltic binder, built by the mixing method and laid on a concrete foundation. The wearing surfaces of 12 sections were laid on a broken stone foundation, 5 built by the penetration, and 7 by the mixing method. In all but 1 section built by the mixing method the stone was

heated. The remaining 4 are made up respectively of Portland cement concrete pavement, water-bound macadam, asphalt, and a surface application of asphalt and sand on an old macadam strip.

A large amount of data is given, outlining in detail the methods of construction and the binders used in the various sections, with the unit cost per square yard and daily records of the temperature and traffic census. Because of the excessive cost of constructing a small section of each kind of pavement a comparison of costs per square yard was not made.

Public roads are public necessities, J. H. PRATT (*N. C. Geol. and Econ. Survey, Econ. Paper 32, 1913, pp. 62*).—This paper consists chiefly of recent decisions of the supreme court of North Carolina on the validity of county and township bond issues for constructing public roads, and on the expenditure of funds from the general treasury of the county for this same purpose.

Explosives in agriculture, G. MARKS (*Agr. Gaz. N. S. Wales, 24 (1913), No. 1, pp. 1-18, pls. 6, figs. 16*).—From extended observations and experiments the author outlines in detail methods of blasting stumps and trees, and of subsoiling and planting orchards by the use of gelignite, a high velocity explosive.

He concludes that no set rule can be applied as to the amount and location of the explosive in stump and tree blasting, as each stump and tree presents an individual problem. For subsoiling he states that holes should be bored from 2 ft. 6 in. to 3 ft. deep 16 ft. apart and the charge placed at the bottom. The size of charge varies from $1\frac{1}{2}$ to 2 cartridges, depending on the nature and condition of the subsoil, and should disturb the soil for a radius of from 8 to 9 ft.

For the best results it is deemed essential that the subsoil be fairly dry since if charges are exploded while the clay is wet or saturated the plastic condition causes it to yield and an excavation is made without the desirable series of fissures. In a dry subsoil the effect of the explosives is seen in the breaking of the clay and openings and fissures are produced in all directions. On slopes care and judgment should be exercised so as not to interfere with drainage, and to make sure that the arrangement of charges is such that the fissures are connected. Small charges arranged in lines and fairly close together are preferable to large charges a greater distance apart.

He states in conclusion that a considerable saving can be effected in cost and time by this method, ranging from 25 to 50 per cent.

Graphical methods of determining practical dimensions of retaining and storage walls with the maximum stresses, L. HAUSKA (*Centbl. Gesam. Forstw., 39 (1913), No. 2, pp. 66-75, figs. 5*).—This is a mathematical and graphical discussion of the subject, which has been applied to the work of the German forestry service.

Sand cement as used by the United States Reclamation Service (*Engin. News, 69 (1913), No. 12, pp. 562, 563*).—Investigations and comparative tests by C. H. Paul are reported of sand cement as used in irrigation works and made of an equally blended mixture of sand and Portland cement, finely ground, and of standard Portland cement. The conclusion is drawn that the use of sand cement in mass work where the requirements are enough to justify the installation of grinding machinery, where suitable blending material is available, and where the transportation charges on Portland cement amount to a considerable portion of its cost laid down, will result in a marked saving in construction costs and will give a product which is the equal of Portland cement.

Value of washed sand and gravel in concrete (*Cement and Engin. News, 25 (1913), No. 3, pp. 88, 89, fig. 1*).—Comparative tests of the use of washed and unwashed sand and gravel in concrete show a saving in cement by washing and a gain in strength. A mixture of 1:3:5 of the washed material developed a greater crushing strength in 28 days than a mixture of 1:2:3 of unwashed

material. It is estimated that this saving in the amount of cement exceeds the added cost of washing the sand and gravel by from 15 to 25 cts. per cubic yard of concrete.

Action of acids, oils, and fats on concrete, W. L. GADD (*Abs. in Engin. News*, 69 (1913), No. 11, p. 504).—The results of experiments on the action of acids, oils, and fats on concrete indicate that vegetable and animal oils are destructive of concrete, but that mineral oils have no apparent effect upon concrete which has reached a certain degree of set.

Electricity on the farm, W. L. UPSON (*Ann. Rpt. Comr. Agr. Vt.*, 4 (1912), pp. 24-36).—The author points out the economic advantages of rural electric transmission lines, telephones, trolleys, motor trucks, and electric lights to farmers, calls attention to specific cases in which these have proved profitable, and outlines the method of generation, storage, and application of electrical energy on farms by means of engines, dynamos, storage batteries, and motors.

Wind electricity, E. FREUND (*Wiener Landw. Ztg.*, 63 (1913), No. 8, pp. 82-84, figs. 11).—This article deals with the generation of electricity on farms by wind power, describes an existing plant, and outlines in detail the equipment necessary for satisfactory operation. Experimental work indicates that the chief difficulty is encountered in adapting the electrical apparatus to the variations in wind velocity, for which purpose designs of compensators and automatic switches are submitted.

Possibility and practicability of generating electricity by wind power, E. FREUND (*Wiener Landw. Ztg.*, 63 (1913), No. 9, pp. 96, 97, fig. 1).—This article reports investigations of the economy and efficiency of wind power for generating electricity on farms, which indicate that where there was sufficient wind velocity to operate effectively the electrical apparatus for the greater part of the year, electrical power was generated at a cost of from 1 to 1½ cts. per kilowatt hour, including interest and depreciation.

Power from kerosene, L. W. ELLIS and W. R. DRAY (*Sci. Amer. Sup.*, 75 (1913), No. 1937, pp. 105, 106, figs. 4).—A system is outlined as particularly applicable to farm engines whereby oil, kerosene, and distillates are used in the ordinary type of gas engine. The system covers (1) an automatic variation in the quantity of fuel mixture in accordance with the slightest variation in speed and load; (2) a degree of compression dependent upon the quantity of the mixture inhaled; (3) a correct proportioning of the mixture under all conditions of high and low compressions; (4) a temperature of combustion exactly adapted to the quality of fuel used and the compression; (5) automatic control of the internal temperature by use of water as a part of the fuel mixture; (6) thorough and uniform mixture of the fuel, water, and air charge by mechanical means; (7) automatic variation in the time of firing in response to variations in the speed and power; (8) means for changing the limits of rotative speed; and (9) means for starting on a limited supply of volatile fuel.

The gas, petrol, and oil engine, D. CLERK and G. A. BURLS (*New York, 1913*, vol. 2, rev. ed., pp. VII+838, figs. 481).—This book deals with the practical problems involved in the design, construction, and operation of gas, petrol, and oil engines. It contains chapters on the development of the 4-stroke and 2-stroke gas engines; ignition; speed regulation, governors, and governing methods; gaseous fuels; petroleum, petrol, paraffin oils, and alcohol; petrol engines; carburetors; heavy oil engines; marine gas and oil engines; and the future of internal combustion motors. An appendix is given on the acceleration of reciprocating parts.

New fuel for motor vehicles, E. N. GUNSAULUS (*Daily Cons. and Trade Rpts.* [U. S.], 16 (1913), No. 60, pp. 1272, 1273).—Attention is called to a newly discovered fuel for internal combustion engines which is intended to supplant

the use of gasoline. This fuel is made from paraffin, its conversion being accomplished by a chemical process and without the use of heat. From numerous recent tests, the claims are made that it is superior to gasoline in efficiency, economy, and cleanliness, and can be used in any ordinary type of carburetor. The cost of the finished product is estimated at about 25 per cent less than gasoline.

Notes of agricultural tractors, M. RINGELMANN (*Ann. Inst. Nat. Agron.*, 2. ser., 11 (1912), No. 2, pp. 223-241, figs. 7).—Several tractive effort curves and tables of data are given from 16 dynamometer tests of 9 different motor plows. For purposes of comparison the results are computed from a 100 meter length of furrow plowed by each machine, and the variations in tractive effort are calculated in percentages of the average tractive effort.

The maximum tractive effort for the 9 machines varied from 110.55 to 154.70 per cent of the average tractive effort required, over lengths of plowing varying from 2 to 27 per cent of the total length. It is concluded that the tractor should be designed to exert a maximum tractive effort at the draw bar of 1.75 times the average tractive effort required by the plow, thus providing for power losses caused by friction, starting, and the sinking and slipping of the drive wheels.

Standards in gas tractor construction, W. C. BRANDON (*Gas Engine*, 15 (1913), No. 2, pp. 101-106).—This is a paper read before the American Society of Agricultural Engineers in which the author points out the importance of standardization in the design and construction of gas tractors. Among the parts of the gas tractor which he considers to be fit subjects for standardization, are horsepower rating, magneto dimensions, spark plugs, screw threads, bolt, nut, and screw heads, wheel tire sections, carburetor fittings, plow hitches, and draw bars.

An experience in steam [plowing], N. JACKSON (*Canad. Thresherman and Farmer*, 18 (1913), No. 3, pp. 46, 71, figs. 2).—From comparative experiments with the use of animal and mechanical power for plowing it is stated that by the use of a 32 h. p. cross compound steam tractor, burning coal, an average of 16 acres of land per day was plowed, cultivated, and sown to flax in one operation at a total average cost of \$1.87 per acre, while a neighboring piece of land received the same treatment by animal power at a total average cost of \$6.50 per acre. Using flax straw as fuel the same engine plowed 24 acres per day at a total average cost of 88 cts. per acre.

Power plowing in the Philippines, Z. K. MILLER (*Philippine Agr. Rev.* [English Ed.], 6 (1913), No. 2, pp. 66-73, pls. 4).—A number of experiments with traction and steam cable outfits, plowing in various soils, are reported.

The results indicate the superiority of the disk plow over the gang plow in hard ground covered with trash. It is shown that the cost of traction plowing in the Philippines depends almost entirely on the class of soil, fuel, and season, and varies from 70 cts. to \$3.50 per acre. The cost of plowing with the cable plow will vary from \$2 to \$3 per acre according to the condition and kind of soil, but it is stated that the first cost of the steam cable outfit makes it prohibitive on the average plantation.

Motor plows and cultivating machinery, LUEDECKE (*Fühling's Landw. Ztg.*, 61 (1912), No. 23, pp. 785-807, figs. 8).—This article deals with the economy of motor cultivation, gives reports of fair success from various experiments with motor plows, and describes several types of tractors, tractor plows, and disk and moldboard gang plows, giving considerable information and data in regard to their operation, first cost, and cost of operation and maintenance. Various investigations show that on a large number of farms where mechanical power is used it is cheaper to use some animal power. In consequence, it is suggested that in all cases a careful and accurate study of conditions be made in

order to determine the most economical distribution of work between animal and mechanical power.

Competitive tests of cultivators and weed cutters, VON STOCKHAUSEN (*Arb. Deut. Landw. Gesell.*, 1913, No. 237, pp. 1-23, figs. 21).—Thirty-one cultivators and weed cutters were tested in 3 groups. Group 1 comprised those with a working width less than 6 ft., group 2 those with a working width from 6 to 12 ft., and group 3 those of a working width of 12 ft. or more.

The machines gave both favorable and unfavorable results, it being found in most cases that the machine tested was adapted to some particular conditions of soil. This indicates that it is practically impossible to develop a machine which will satisfy all conditions. Several improvements are suggested in the shaping and tempering of shares, in the means of raising and lowering shares and beams, in the arranging and spacing of shares, and in the arrangement of the hitch.

Trials with cultivators, A. CHRISTENSEN and M. DALL (*Tidsskr. Land-økonomi*, 1913, No. 1, pp. 34-75, figs. 29).—The tests included 22 single and double row cultivators of different makes. Illustrated descriptions are given of the different machines, with the decision of the judges in regard to their strong and weak points. Some of the machines gave very good results and were excellent in construction, but for the most part the judges criticised the shape and temper of the shares, the stiffness of the moving parts, and the poorly designed hitches.

The grain drill, C. A. GILMORE and H. MILNE (*Canad. Thresherman and Farmer*, 18 (1913), No. 3, pp. 7-9, figs. 14).—In this study of the grain drill each part is considered separately, special attention being paid to different styles of construction and the material used, and comparison being made of the different types. The requisites of a grain drill are summed up as follows: (1) Furrow openers that will make a proper seed bed and deposit all the seed at the desired depth in any soil, (2) an adjustable force feed suited to distribute evenly all kinds of seed, and (3) light weight and draft combined with strength and durability.

A table for grain drill adjustment is given.

Practical country buildings, W. A. RADFORD (*Wausau, Wis.*, 1912, pp. 192, figs. 501).—This is a handbook containing plans, details, and specifications for the construction of dwellings, barns, stock and implement sheds, ice houses, and other types of farm structures.

Planning the farm house, L. W. CHASE (*Canad. Thresherman and Farmer*, 18 (1913), No. 3, pp. 36, 38, 39, 70, figs. 4).—This article gives suggestions on the general arrangement and design of country homes, and includes plans showing their application. The arrangement is based chiefly on the amount of heat required by each room and the idea of obtaining a combination of convenience, comfort, and economy.

Conventional designs for agricultural engineers (*Amer. Thresherman*, 15 (1913), No. 2, pp. 92, 93).—Two hundred conventional designs, compiled by L. W. Chase, are given, which have been adopted by the American Society of Agricultural Engineers as recommended practice.

RURAL ECONOMICS.

Interest paid by farmers on loans (*U. S. Dept. Agr., Bur. Statis. Crop Reporter*, 15 (1913), No. 4, pp. 27-29).—Replies collected by the Bureau of Statistics to inquiries made of about 3,000 bankers in the United States are here summarized as to the average of the current rates of interest paid to banks by farmers for 3 to 6 months' loans (both secured and unsecured) and the

average for similar loans a year ago. The answers received, which represent about 90 per cent of the inquiries sent out, are summarized as follows:

Interest paid by farmers on loans.

State.	1913	1912	State.	1913	1912
	<i>Per cent.</i>	<i>Per cent.</i>		<i>Per cent.</i>	<i>Per cent.</i>
Maine.....	6.14	6.06	Indiana.....	6.47	6.46
New Hampshire.....	5.80	5.80	Illinois.....	6.31	6.25
Vermont.....	6.00	6.00	Michigan.....	6.88	6.82
Massachusetts.....	5.96	5.95	Wisconsin.....	6.24	6.23
Rhode Island.....	5.95	5.91			
Connecticut.....	5.92	5.92	Divisional average.....	6.38	6.35
New York.....	5.99	5.99			
New Jersey.....	5.92	5.92	Montana.....	10.32	10.32
Pennsylvania.....	5.93	5.93	Wyoming.....	9.37	9.37
			Colorado.....	9.24	9.32
Divisional average.....	5.96	5.96	New Mexico.....	10.57	10.66
			Arizona.....	10.15	10.50
Minnesota.....	7.93	8.05	Utah.....	8.61	8.63
Iowa.....	7.21	7.23	Nevada.....	9.03	9.30
Missouri.....	7.28	7.28	Idaho.....	9.92	9.98
North Dakota.....	10.70	10.89	Washington.....	8.99	9.06
South Dakota.....	9.48	9.69	Oregon.....	8.32	8.27
Nebraska.....	8.00	7.99	California.....	7.44	7.43
Kansas.....	8.37	8.44			
			Divisional average.....	8.55	8.57
Divisional average.....	8.05	8.11			
Delaware.....	5.94	5.94	Kentucky.....	6.86	6.84
Maryland.....	5.93	5.92	Tennessee.....	8.28	8.26
Virginia.....	6.21	6.21	Alabama.....	10.02	10.00
West Virginia.....	6.24	6.28	Mississippi.....	8.26	9.54
North Carolina.....	6.39	6.38	Louisiana.....	8.33	8.25
South Carolina.....	8.06	8.06	Texas.....	9.97	10.03
Georgia.....	9.98	9.67	Oklahoma.....	10.58	12.10
Florida.....	8.80	8.77	Arkansas.....	9.67	9.66
Divisional average.....	7.36	7.30	Divisional average.....	9.51	9.68
Ohio.....	6.23	6.24	Average for United States.....	7.75	7.79

In New England 6 per cent is the reported predominant rate for short-time unsecured loans, 5 per cent being a common rate for secured loans. Southward from Maryland the rate tends to increase, except in Florida, where it averages somewhat less than in Georgia.

A Maryland banker writes: "Mortgage loans made to farmers are generally made through lawyers; in addition to their fees for preparing papers, the lawyers charge 2 per cent for getting them the money." A Virginia banker, who reports the interest rate 8 per cent, writes: "When the farmers' organization comes to us to assist them in the purchase of fertilizers we usually charge them 6 per cent." In South Carolina and Georgia the rates quoted vary very much, the range being mostly 8 to 12 per cent on loans ranging from 8 to 10 or 12 months. A North Dakota banker, reporting the rate 10 per cent, says: "Many of our loans draw 12 per cent, especially loans to renters." Well-secured loans are secured in some of the North Central States east of the Mississippi River at 5 per cent, the average being between 6 and 7 per cent. A bank from Montana says: "Loans are made to farmers here from 3 to 5 years at 10 per cent. The paper is then sold in the East at 6 per cent." An Idaho banker reporting 10 per cent average, writes: "Our loan rates to farmers are the same as to merchants and stockmen; in fact, we have trouble in supplying demand for money at 10 per cent rates." The 40 returns from Oklahoma report as follows: One at 8 per cent, 24 at 10 per cent, 2 at 11 per cent, 5 at 12 per cent, 5 at 15 per cent, 1 at 18 per cent, and 2 at 20 per cent.

Similar excerpts are given from bankers in other States.

Loans and credits granted on agricultural products in Russia (*Landw. Marktztg.*, 14 (1913), No. 25, pp. 81, 82).—Notes and other data are given in this article showing the methods and extent to which loans have been granted to Russian farmers on agricultural products as security. On January 1, 1908, there were outstanding loans to the extent of 32,000,000 rubles (about \$16,480,000), and on January 1, 1912, there were 110,100,000 rubles. In 1911 more than 131,684,000 pood (about 79,130,683 bu.) of wheat, 30,986,000 pood of rye, 43,043,000 pood of oats, and 42,225,000 pood of barley were put up by Russian farmers as security for loans or extended credit.

The noncooperative rural credit system of Japan, C. SHIMOOKA (*Internat. Inst. Agr.* [Rome], Mo. Bul. Econ. and Soc. Intl., 4 (1913), No. 1, pp. 112-128).—In addition to a historical summary of the credit systems of Japan this article describes in detail the work and progress of the noncooperative rural credit system as operated through the Mortgage Bank and the agricultural and industrial banks, they being incorporated by the Imperial Government in 1896.

The Mortgage Bank began operations with a capital of 10,000,000 yen (about \$5,000,000), of which 2,500,000 yen was paid up. Its primary function is to supply money to the needs of industry and agriculture, which it does largely through the agricultural and industrial banks. It has the privilege of issuing mortgage debentures with the restriction that they shall not exceed 10 times the paid-up capital of the bank, and is exempt from paying registration and stamp duties. The debentures issued since its establishment amounted in 1911 to 89,001,560 yen, and loans granted for aiding agricultural undertakings numbered 16,402 and amounted to 27,187,233 yen.

To meet the demand for small loans, sometimes without security, the agricultural and industrial banks were provided. They are stock companies, established in each of the prefectures, with a capital of not less than 300,000 yen. The loans are made on real estate as security or on personal credit when 20 or more individuals are bound together in groups with joint liabilities. They have the privilege of issuing debentures to the amount of 5 times the paid-up capital. In addition they are subsidized to the extent of 10,000,000 yen, to be distributed among the prefectures in the proportion of 70 yen for every 100 cho (1,600 acres) of taxable land. These banks at the beginning of 1911 numbered 46 and had a paid-up capital of 30,619,030 yen. The maximum rate of interest charged is 8 per cent. Tables are given showing the number and amount of loans and the character of undertakings for which they were used.

Rural cooperation, E. LAHITTE (*La Cooperación Rural. Buenos Aires: Govt.*, 1912, pp. 59).—This volume presents a historical summary of the efforts and progress made in a number of countries in establishing and maintaining rural organizations to aid the agricultural classes properly to finance their farming operations, market their products, and purchase farm supplies. Special attention is given to the cooperative organizations in Italy, Germany, France, Austria, United States, and Argentina.

Waste in distribution, C. R. VAN HISE (*Amer. Coop. Jour.*, 8 (1913), No. 8, pp. 660-662).—This is an address in which the author discusses some of the wasteful practices exemplified in the distribution of farm products in the United States, suggesting cooperation on the part of the producer, consumer, and distributing agency as a means of lessening the cost of marketing such products.

The economy of small holdings, C. CAMPBELL and C. TURNOR (*Mark Lane Express*, 109 (1913), No. 4258, pp. 643, 644).—As members of a special committee dealing with questions involving the administration of the small holdings act in Great Britain the authors call attention in this article to certain difficulties and economic principles underlying the development of small holdings,

and make some suggestions as to how better results may be obtained. Among their findings the following may be noted: (1) Right men must be found to become small holders, it being stated that a laborer or a foreman on a well-cultivated large farm usually does not make a successful small holder because he undertakes economically unsuited systems of cropping and management; (2) there must be a system of education suited to the needs of rural life and small holders; (3) a sound and economical way must be provided to meet the demands for capital; (4) development in colonies and not in isolated units will insure the greatest chance of success, as it gives greater opportunity for organization and cooperation; and (5) equipment for the holding must be simplified by providing only essentials at first, adding to them later on as the tenant prospers, thus relieving him of interest charges on unnecessary equipment when he can least afford to pay it.

Agricultural laborers (*Bd. Trade [Gt. Brit.], Rpt. Changes in Rates of Wages and Hours of Labour, 1911, pp. 26-29, 137-139*).—This part of the report treats of changes in the rates of wages and hours of labor of regularly employed agricultural laborers of England and Wales in 1911 with comparative statistics for 1902-1910. The information furnished applies to 630 rural districts, or about 96 per cent of the whole. The changes noted in most of the districts ranged from 6 pence to over 2 shillings per week. Tables are given showing the amount of change in each district, the month or period in which the change generally took place, and the number of laborers affected thereby.

Insurance against damage to crops by hailstorms (*Jour. Bd. Agr. [London], 19 (1913), No. 12, pp. 1009-1013, pl. 1, fig. 1*).—This article presents a general summary of an investigation recently made in England and Wales as to the amount of damage done to crops by hailstorms and the measures adopted in regard to insuring against loss occasioned thereby. A list showing the premiums charged for various crops per acre or £100 value of crop is given. Together with a statement, summarized for each county, of the correspondents' opinions of the amounts of insurance affected and damage done by hailstorms. The usual rate per acre for wheat, barley, oats, rye, straw, clover, turnips, and carrots is 6 pence and for beets and mangolds 1 shilling. Higher rates are charged for beans and peas or special crops grown for seed.

The potentialities of southern agriculture, J. F. MERRY (*Manfrs. Rec., 63 (1913), No. 12, pt. 2, pp. 43-49, figs. 18*).—The author discusses and illustrates in this article the agricultural progress of 16 Southern States for the last 30 years, pointing out their agricultural possibilities by reason of their forests, varieties of soil, diversity of crops, climate, markets, and transportation facilities. The capital invested in farms in the States taken as a group is stated to have increased from \$3,923,560,000 in 1890 to \$10,961,865,000 in 1910, or 179 per cent, as compared with 156 per cent for the United States as a whole. Data are given as to the acreage, yield, and value of several farm crops which are successfully and profitably grown in the group.

Agriculture: Porto Rico (*Bur. of the Census [U. S.], Bul., Agr. Porto Rico, 1910, pp. 29, fig. 1*).—This bulletin presents a complete statement of the statistics of agriculture for Porto Rico collected in the census of 1910.

The number of farms reported is 58,371, and the area of farm land 2,085,162 acres. The value of farm property, including land, buildings, implements and machinery, and live stock amounted to \$102,379,000, of which \$73,968,000 represented the value of land, \$8,753,000 buildings, and \$8,711,000 implements and machinery. The average value of land per farm is reported as \$1,267 and of buildings \$150. Of the total number of farms 46,799 were operated by owners and 10,422 by tenants. Of the number operated by owners 44,398, or 94.9 per cent, were free from mortgage.

Tables are also given showing the farms by size groups; domestic animals and poultry on farms; acreage, yield, and value of farm crops; farm expenses; color of farmers, population, etc., all being given by municipalities.

Agriculture as practiced in Germany, W. L. OWEN (*Cal. Cult.*, 40 (1913), No. 9, p. 259).—Following a personal study of agricultural conditions in Germany the author makes some observations in this article regarding practices in German agriculture as contrasted with conditions and agricultural practices in the United States.

It is noted that in 1900 the German population was over 10 times as dense as in the United States. The improved land of the United States was 21.8 per cent of the total area, while that of Germany was 60 per cent. The percentage of tenancy in Germany has remained virtually constant since 1888 at 14 per cent. Where the average farm in the United States is 146.6 acres, more than 50 per cent of the German farms are less than 6 acres in size.

Data are also given showing the difference in capitalization of land required in extensive and intensive farming.

Pastoral life on the French Alps, AREOS (*Bul. Mens. Off. Renseig. Agr. [Paris]*, 12 (1913), No. 2, pp. 158-175).—This article presents the results of a recent study of agricultural conditions along the Alps in France, pointing out the economic effect of emigration and change of population upon the life of the peasants and their industries. Special attention is directed to the progress of recent years in the cattle growing and cattle breeding industries.

Crop Reporter (*U. S. Dept. Agr., Bur. Statist. Crop Reporter*, 15 (1913), No. 4, pp. 25-32, figs. 5).—Notes and tables are here presented showing comparative prices of agricultural products; condition of winter wheat and rye April 1; condition of farm animals April 1 and estimated losses during the year ended March 31, 1913, with comparisons; interest paid by farmers on loans (see page —); cost of raising horses; monthly receipts and stocks of butter and eggs; cotton seed crushed and linters obtained; yearly losses of live stock per thousand head from disease and exposure, 1884-1913; cotton crops of 1912, 1911, and 1910; expenditures to promote cotton production by foreign countries; production of beet sugar and sugar beets, 1912; temperature and precipitation statistics; prices to producers of farm products; and range of prices of agricultural products at important markets.

Prices of commodities in 1912, A. SAUERBECK (*Jour. Roy. Statist. Soc.*, 76 (1913), No. 4, pp. 396-409).—Notes and tables are here presented showing the course of prices of 45 commodities during the last 20 years as compared with the standard period of 11 years, 1867-1877. A summary of index numbers representing prices of commodities shows that there was an increase for vegetable food from 59 in 1893 to 78 in 1912, and an increase for animal food, meats, etc., during the same period from 85 to 96, while sugar, coffee, and tea decreased from 75 to 62. Quarterly and yearly movements of prices and individual farm crops and manufactured products are shown for the same period.

The church of the open country, W. H. WILSON (*New York, 1911*, pp. 238, pls. 18).—This volume treats of the relation and mission of the country church to the reorganization of rural life and rural institutions. The several chapters take up rural decay and repair; church and community; schools for country life; rural morality and recreation; cooperation and federation; poverty and prosperity, the principle of service; and leadership of the community. A lengthy bibliography is appended.

The country church and rural welfare (*New York and London, 1912*, pp. 152).—This volume presents a number of contributions by men representing agricultural schools and colleges, theological seminaries, country churches, and other activities, all of whom endeavor to make clear the needs of the country

and rural population and the best way to meet these needs. It is edited by the International Committee of Young Men's Christian Associations.

AGRICULTURAL EDUCATION.

The influence of various educational institutions upon the development of agricultural science, R. W. THATCHER (*Science, n. ser.*, 37 (1913), No. 954, pp. 566, 567).—This is a study made of the degrees, exclusive of honorary degrees, granted to the 147 men who are, or who have been during the past 5 years, members of the Society for the Promotion of Agricultural Science.

"It is perhaps of interest to note that the 147 men . . . have received 123 bachelor's, 82 master's, and 51 doctor's degrees earned by undergraduate and graduate study. While statistics as to the scholastic attainments of workers in other educational fields are not available for comparison, it appears to the writer that the scholastic training and ability of the men who are actively engaged in the promotion of agricultural science is certainly such as to command very high respect."

Motive of the college of agriculture of the University of California, T. F. HUNT (*Univ. Cal. Chron.*, 15 (1913), No. 1, pp. 137-151).—This is an address delivered at the dedication of Agricultural Hall, November 20, 1912 (E. S. R., 27, p. 696), and outlines the tentative organization and scope of the college of agriculture.

First congress of agricultural education of Sao Paulo (*Primeiro Congresso de Ensino Agricola, 1911, São Paulo. Sao Paulo, 1912, pp. XXXVII+153, figs. 39, pls. 2*).—The proceedings and addresses of the first congress of agricultural education for the State of Sao Paulo held May 24-30, 1911, are given.

Annual report on the distribution of grants for agricultural education and research in the year 1911-12 (*Bd. Agr. and Fisheries [London], Ann. Rpt. Agr. Ed. and Research, 1911-12, pp. XV+112*).—This is a report on the grants distributed in England and Wales by the Board of Agriculture and Fisheries, to which appendixes are added, as to the institutions receiving grants, the provisions made for agricultural education by county councils in England and Wales, a memorandum of revised arrangements between the Board of Agriculture and Fisheries and the Board of Education, and a memorandum on the scheme for the promotion of agricultural research and advisory work.

Dairy instruction in foreign countries, G. ELLERCHT (*Malkerkid.*, 25 (1912), No. 47, pp. 1149-1180).—The main features of the system of dairy instruction in Norway, Sweden, Finland, Prussia, Holland, Belgium, Switzerland, France, Great Britain, and Wisconsin are outlined.

Two kinds of agricultural education (*Vocational Ed.*, 2 (1913), No. 5, pp. 428, 429).—At a rural education conference in Massachusetts in February, Dr. David Snedden maintained that "experience now proves conclusively that two distinct types of agricultural education, namely, the general and vocational, are possible with young people from 14 to 18 years of age.

"A course in general agricultural education may be made to resemble and to parallel any other general course in the high school. Recitations and laboratory work may be held for a limited number of periods per week. The instruction in the classroom can be made concrete to some extent by exercises in gardening, either on school grounds or at home, and by various laboratory tests. The general objects of such a course are the following: To give more appreciation of agriculture as one of the great fields of human endeavor; to give insight into the possible applications of various sciences to this great industry; to develop ideals as to country and agricultural life, and finally, to furnish concrete and attractive studies for pupils not caring for the other more abstract studies of

the secondary school course. . . . The course is primarily a cultural one. It can be so organized as to give great breadth of view."

Vocational training in agriculture, on the other hand, is defined to mean such training as obviously results in mastery of the practice of farming. "It is clear that a secondary school student can be directly and positively equipped for the practice of farming in a school designed for this purpose. In order, however, that agricultural education may result in vocational efficiency, certain conditions are essential: The pupil must give the major portion of his time to concentrated work in this subject; he must not only have practical work, occupying at least half of his time, but his practical work must itself be carried on in large measure subject to commercial conditions; that is, he must produce a definite output and must be able to appreciate the result of his own efforts in terms of profit or loss; he must focus his attention upon the agriculture which is profitable in the neighborhood in which he lives; and such related studies as science, mathematics, accounting, economics, etc., must be held strictly subordinate to and intimately related with the practical work which he is doing."

The greatest danger to agricultural education, as brought out in this discussion of the two types of agricultural education, is that efforts will be made to identify them. "Too many educators still think that vocational efficiency can result from three or five hours per week of verbal instructions in a practical subject. It is for this reason that the public often becomes impatient with the schoolmaster's academic attitude. Most of the agricultural instruction now found in high schools has absolutely no significance in a vocational way, apart from its incidental contributions to the development of vocational ideals. Too many school men are at present palming off on the public bookish courses in agriculture which are certainly a delusion from the vocational point of view.

"Vocational education in agriculture is going to prove expensive as an investment, but it must be regarded as an investment. If rightly conducted it will bring back to the individual taking it and to the community sustaining it, manifold returns within a few years."

New York high school course in farm mechanics and drawing, F. W. HOWE (*Syracusan*, 4 (1912), No. 7, pp. 25-32).—This paper differentiates in a fundamental way the high school course in farm mechanics from that in manual training.

A course in farm mechanics aims "not so much at personal skill of hand as at the understanding and application of mechanical principles in farm work, and its products are designed to be put to the test of practical use rather than to satisfy mere esthetic standards. It prefers, for example, to produce a mechanically correct 'evener' rather than an artistically correct dove-tailed joint on an inlaid collar box. It builds a concrete walk rather than a china closet. It designs the model of a farm gate or a gasoline engine rather than a hand loom. It constructs a set of farmers' bulletin cases rather than an ornamental pen tray. It makes a serviceable grafting tool in preference to a carved paper knife. It does not discourage skill and good workmanship, but it saves time to develop the 'know how' to attack all sorts of problems that the handy man on the farm is expected to solve. It does not teach the 'use of tools,' but it uses tools in the construction of things that are themselves to be used."

Course of study and manual of methods for the district schools of Michigan, L. L. WRIGHT (*Lansing, Mich.: State Supt. Pub. Instr., 1912, 10. ed., pp. 166, pls. 2, figs. 25*).—This edition of the course of study outlines for the first time a plan of work in elementary agriculture for the rural schools of Michigan.

Elementary principles of agriculture, A. M. FERGUSON and L. L. LEWIS (*Sherman, Tex.*, 1911, pp. XVIII+318, pls. 5, figs. 189).—In this revised edition (*E. S. R.*, 20, p. 692) a chapter on public highways has been added.

Crops and methods for soil improvement, A. AGEE (*New York*, 1912, pp. XV+246, pls. 24).—This book is designed to point out some plain everyday facts as to making and keeping soils productive, and treats of the crops, methods, and fertilizers that improve the soil.

Agronomy.—**A course in practical gardening for high schools**, W. N. CLUTE (*Boston, New York, Chicago, and London* [1913], pp. XVI+296, pl. 1, figs. 195).—This book has been prepared to meet the needs of high schools in cities and towns where agriculture is taught, and in which the problems that confront the teacher are in some respects different from those that come up in rural communities. In addition to chapters on the chemistry and physics of soils much attention is given to the various factors attending the making of a good city garden. Some attention is also given to plant breeding and decorative planting. Practical exercises and references to literature close each chapter. The appendix contains a list of 75 shrubs, 15 woody vines, and 50 herbaceous perennials.

Chemistry applied to practical farming and home mixing fertilizers, G. I. SMITH (*Coats, N. C.*, 1913, pp. 55, pl. 1).—This book consists of a series of lessons, in the form of questions and answers, on soils and fertilizers, with formulas for fertilizers for various crops calculated on the ton and acre basis.

Manual of horticulture for grade and high schools, S. S. BUSCH and E. E. GUSTIN (*North Yakima, Wash.* [1913], pp. 223, figs. 183).—This manual is intended for the second year of the high school. The aim is not only to give an outline of the principal subjects of horticulture, arranged according to seasons, but also to explain and illustrate each subject. Further help is given by referring to a number of reference books and bulletins.

The poultryman's handbook, T. F. MCGREW and S. W. SHOEMAKER (*Scranton, Pa.* [1912], pp. XII+343, figs. 112).—A reference book for all persons interested in the production of eggs and poultry for market and the breeding of standard-bred poultry for exhibition.

Bird study in the schools, GRETCHEN L. LIBBY (*Bul. Cal. Fish and Game Com.*, 1912, No. 2, pp. 48, figs. 8).—This bulletin is issued by the Board of Fish and Game Commissioners of California as a simple and authoritative manual on the study of birds for the use of teachers in the public schools. Among the subjects considered are how to study birds, how to teach bird study in the schools, how to attract birds, the economic value of birds, and some material helpful in bird study.

Boys' corn growing contest in 1911.—**Suggestions for corn growing and conducting a contest**, N. SCHMITZ and W. E. HANGER (*Maryland Sta. Bul.* 165, pp. 273-284).—In this bulletin are reported the results of a boys' corn growing contest conducted in 1911, under the supervision of the station, in 4 counties of the State. Suggestions for corn growing and conducting a contest are also given.

Organization and instruction in boys' corn-club work, O. H. BENSON (*U. S. Dept. Agr., Bur. Plant Indus. Doc. 803*, pp. 14, figs. 7).—This circular is prepared for use in the Northern and Western States, where the boys' corn club work is supervised by the Office of Farm Management of this Department, and discusses some objects of corn clubs, methods of organization, rules and requirements, etc.

Tomato growing as club work in the North and West, L. C. CORBETT (*U. S. Dept. Agr., Bur. Plant Indus. Doc. 883*, pp. 10, figs. 4).—These suggestions and

instructions on the growing of tomatoes have been prepared with special reference to the garden and canning clubs in the Northern, North-Central, and Western States.

Potato growing as club work in the North and West, W. STUART (*U. S. Dept. Agr., Bur. Plant Indus. Doc. 884, pp. 10, figs. 4*).—Similar suggestions and instructions are presented on the growing and management of a crop of potatoes.

MISCELLANEOUS.

Twenty-fifth Annual Report of Illinois Station, 1912 (*Illinois Sta. Rpt. 1912, pp. 23*).—This contains the organization list, lists of the publications of the station since its establishment and during the fiscal year, a brief statement concerning some of the lines of work, and a financial statement for the fiscal year ended June 30, 1912.

Annual Report of Nevada Station, 1911 (*Nevada Sta. Rpt. 1911, pp. 48*).—This contains the organization list and reports of the board of control, the director, and heads of departments. The report of the director includes the financial statement for the fiscal year ended June 30, 1911. The experimental work reported in the departmental reports is for the most part abstracted elsewhere in this issue.

Annual Report of Nevada Station, 1912 (*Nevada Sta. Rpt. 1912, pp. 48*).—Data corresponding to the above are reported for the fiscal year ended June 30, 1912. The experimental work is for the most part abstracted elsewhere in this issue. A list of the available bulletins of the station is appended.

Twenty-fifth Annual Report of Vermont Station, 1912 (*Vermont Sta. Rpt. 1912, pp. XX+610, pls. 36, figs. 18*).—This contains the organization list, a brief announcement concerning the station, a financial statement for the fiscal year ended June 30, 1912, a report of the director on the publications and work of the station, and reprints of Bulletins 161 to 166, previously noted, and of Bulletin 167 abstracted elsewhere in this issue.

Finances, meteorology, index (*Maine Sta. Bul. 208, pp. 467-474+XII*).—This contains the organization list of the station; meteorological observations noted on page 121 of this issue; a financial statement for the fiscal year ended June 30, 1912; an index to Bulletins 198 to 208, which collectively constitute the twenty-eighth annual report of the station; a list of the publications issued during the year; and announcements and notes on the work, personnel, and equipment of the station.

Experiment Station Work, LXXIV (*U. S. Dept. Agr., Farmers' Bul. 527, pp. 24, figs. 7*).—This number contains articles on the following subjects: Peonies, advantages of spraying potatoes, marketing wool, retail buying of beef, tobacco dips for sheep scab, and sewage disposal for rural homes.

NOTES.

Alabama College and Station.—A. B. Massey, formerly assistant in botany in Clemson College, has been appointed assistant professor of botany. C. S. Ridgway, instructor in botany and assistant botanist, has resigned to accept a position with the Bureau of Plant Industry of this Department. H. M. Conolly, field agent in horticulture, has accepted a similar position with the Department and has been succeeded by G. V. Stelzenmuller.

Connecticut College and Stations.—The state appropriations for the ensuing biennium aggregate \$261,000. Of this amount \$195,500 is for work at Storrs, including \$60,000 for maintenance of the college, \$9,000 for maintenance of the station, \$10,000 for extension work, \$60,000 for an auditorium and armory, and the remainder for sewage and water supplies, four additional cottages, etc. The State Station receives \$65,500, of which \$39,500 is for general maintenance, \$5,000 for the foodstuffs control, \$8,000 for entomology, and \$13,000 for forestry, including \$2,000 for the purchase of land.

Delaware College and Station.—The annual Farmers' Day on June 16 was attended by about 5,000 farmers and others from Delaware and adjoining States. Governors Miller of Delaware and Goldsborough of Maryland were among the speakers. Ground was broken for the new women's college building during the day.

The summer school for teachers, for which the last legislature made an appropriation, opened June 23 with a satisfactory attendance.

T. F. Manns and J. J. Taubenhaus of the division of plant pathology of the station received the degree of doctor of philosophy from the University of Pennsylvania at its recent commencement.

Maine University and Station.—W. L. Slate, jr., has resigned as associate professor of agronomy to accept a position with the Connecticut Storrs Station, and has been succeeded by H. S. Osler. R. W. Redman, assistant professor of animal husbandry, is to devote his time exclusively to extension work. O. A. Jordan and E. N. Boland have been appointed instructors in animal husbandry, Cornelia Palmer assistant professor of home economics, and Anna J. Keller and Dorothea Beach instructors in home economics.

Dr. F. M. Surface of the Kentucky Station has returned as biologist of the station.

Massachusetts College.—An extended investigation of the institution has been made by the state commission on economy and efficiency. One outcome of this was its recommendation that the system of annual state appropriations for maintenance be supplanted by appropriations for a five-year period. This recommendation was adopted by the legislature, and allotments have been made as follows: For 1914 \$280,000, 1915 \$303,000, 1916 \$325,000, 1917 \$341,000, and 1918 \$362,000. This is a total of \$1,611,000, or an average of \$322,000 per year. An appropriation of \$50,000 was also granted for new buildings, including a college infirmary, and authority conferred for exchange of certain tracts of land.

Minnesota University.—*Science* notes the appointment of Dr. E. Dana Durand, former director of the U. S. Bureau of the Census, as director of the bureau of research in agricultural economics in the college of agriculture.

New Mexico College.—Dr. George E. Ladd, for the last five years president of the Oklahoma School of Mines, has been appointed president and entered upon his duties July 1.

Cornell University and Station.—A new calendar year has been adopted by the college of agriculture under which the year will be divided into three terms of approximately equal length, except that in the summer, which will be somewhat shorter. Members of the instruction staff are to receive three months' vacations, but these may be distributed throughout the year.

The resignation of Director L. H. Bailey has been accepted, to take effect at the close of the present university fiscal year, July 31.

The department of plant physiology has been merged into a new department of botany under the direction of Dr. K. M. Wiegand, with assistant professor Lewis Knudson remaining immediately in charge of the physiological work. The departments of farm practice and farm-crops have been separated, with Prof. John L. Stone in charge of the former and Prof. E. G. Montgomery of the latter. The department of horticulture has been divided into departments of floriculture and vegetable gardening.

Recent appointments include as professors Frank B. Moody, of the Wisconsin University and Station, in extension work in forestry and H. A. Hopper in extension work in animal husbandry, and as assistant professors Mrs. A. B. Comstock in entomology and nature study, Miss Alice G. McCloskey in rural education, B. B. Robb in rural engineering, W. W. Fisk in dairy industry, Ralph W. Curtis in landscape art, G. A. Everett in extension teaching, and H. B. Knapp in extension work in pomology.

New York State Station.—A provision of the annual appropriation bill passed by the last legislature gives the station a fund of \$15,000 for conducting field and orchard investigations and studies of sanitary milk production. This will permit of considerable extension of the station activities.

Another act allots \$5,000 for the investigation of hop diseases. In furtherance of this work, three hop yards, including about 12 acres, have been leased near Cooperstown, N. Y., and F. M. Blodgett, a graduate student of Cornell University, has been appointed associate botanist of the station to conduct the investigations.

R. D. Anthony of the department of pomology of Cornell University has been appointed to succeed Richard Wellington as associate horticulturist.

North Dakota College.—George W. Randlett, director of extension work and assistant professor of agriculture, has also been given charge of farmers' institute work in the State, succeeding T. A. Hoverstad, who is devoting his entire attention to commercial work.

Oklahoma College.—John W. Wilkinson has resigned as supervisor of boys' and girls' clubs to become editor of the *Oklahoma Farmer* and has been succeeded by T. B. Wortman. R. V. McBryde has resigned as poultryman to assume charge of the poultry department at the Western Washington sub-station.

Ohio Station.—L. H. Goddard, chief of the department of cooperation, and W. A. Lloyd, assistant in that department, have resigned to accept positions with this Department. The following appointments have been recently made: Duane C. Babcock, assistant in botany, J. W. Colland, assistant in forestry, Charles W. Knudsen, assistant in nutrition, and F. L. Allen, county agent for Geauga County.

Oregon College and Station.—The resignation is noted of F. L. Kent as professor of dairy husbandry and dairy husbandman to engage in commercial work.

Texas College.—Press reports announce the resignation of President R. T. Milner.

Vermont University and Station.—At a recent meeting of the board of trustees resolutions were adopted in recognition of the long and faithful service of Hon. Cassius Peck and Hon. Gardner Smith Fassett, both of whom have served continuously since their appointment in 1890 as members of the board of control of the station and are now retiring from active service. The station affairs will henceforth be administered by a committee of two members of the board, Ex-governor E. J. Ormsbee continuing as one and N. K. Chaffee of Rutland being designated as the second.

Virginia College.—The shop building was burned June 14, causing a loss of from \$150,000 to \$200,000, of which \$50,000 is covered by insurance.

Washington College and Station.—A. L. Melander, head of the department of zoology and entomologist of the station, has been granted a year's leave of absence in order to carry on entomological studies in Harvard University and elsewhere. W. L. Hadlock has resigned as assistant chemist to engage in commercial work.

West Virginia University.—Recent appointments include Firman E. Bear, assistant professor of agricultural chemistry in Ohio State University, as professor of soils, O. H. Kyle as agricultural editor, Anthony Burg as assistant in plant pathology, William B. Kemp as assistant in agronomy, R. R. Jeffries, of Ohio State University, as assistant in horticulture, Edgar L. Andrews as assistant in poultry husbandry, Miss Sadie Guseman as assistant in home economics and in charge of girls' canning clubs, J. L. Young as butter maker, and H. L. Page as herdsman.

Vermont Rural Life Conference.—At the invitation of the interchurch federation of Vermont, a rural life conference was held June 7-13 in connection with the regular summer session of Middlebury College. Dr. Robert J. Sprague, head of the division of humanities and professor of economics and sociology in the Massachusetts Agricultural College, was leader of the conference and delivered a course of lectures on rural sociology. A large number of state organizations interested in country life problems, together with this Department, cooperated in the conference and a special feature was a collection of rural life literature and other illustrative material.

American Veterinary Medical Association.—The fiftieth anniversary meeting of this association is to be held in New York City September 1-5.

Among the matters to be considered is the question of the propriety of testimonials from college and station officials regarding proprietary veterinary remedies. The committee on advertisements of veterinary remedies of the association, consisting of Drs. N. S. Mayo of Virginia, C. A. Cary of Alabama, and S. B. Nelson of Washington, has recently issued a circular asking the attitude of institutions with regard to this matter, and stating that this committee would suggest to college and station authorities that testimonials as to proprietary veterinary or stock remedies should only be given after a thorough and careful test by well qualified men, and that such testimonials should be submitted to, and approved by, the president or director to be official.

Additional State Veterinary College in New York.—The New York American Veterinary College, allied with New York University, has been designated by the legislature as the state veterinary college of eastern New York. The law is very similar to the act establishing the New York State Veterinary College at Cornell

University, including detailed provisions regarding the handling and accounting of state appropriations, although no appropriation has as yet been provided.

Federal Aid for the Promotion of Agriculture in Canada.—The government of Canada has appropriated \$10,000,000 to cover a period of 10 years beginning with the year ending March 31, 1914, for instruction and research in agriculture. This fund is to be distributed among the provinces according to population. The sum of \$700,000 will be allotted the first year and this amount will be increased by \$100,000 annually until 1917, from which year until 1923 \$1,100,000 will be provided annually.

The work of the federal department of agriculture is to be aided by assisting and developing the live stock, dairying, fruit growing, and other industries along lines of investigation, research, improvement in transportation, markets, etc. The assistance to be given to agricultural education will include the increasing of the facilities and equipment of the agricultural colleges, the establishment of agricultural, dairy, and horticultural schools and short courses, the introduction of agricultural teaching into the public schools, and agricultural extension work. The sum of \$20,000 a year is to be divided between such veterinary colleges as grant degrees and come up to a required standard, and in addition to this the sum of \$20,000 annually is to be allotted to each province regardless of population. Federal supervision over the expenditures by the provinces is provided, and there will be federal inspection of the work done, with a detailed annual report to Parliament.

Agricultural Progress in Latin America.—The department of agriculture of Argentina has established an experiment station at Tucuman for the cultivation of Paraguayan tea plants, the work being under the immediate direction of E. Liniholmberg and Dr. Julio Lopez. The first shipment of 2,000 plants recently arrived. The regional agricultural engineer has established the following cooperative experimental farms in the Province of San Juan: At Chimbas, in charge of Juevenal de Oro; at Concepcion, Dr. Pedro Manrique; at Alto de Sierra, R. Wilkinson; at Angaco Norte, Dr. Daniel Aubone; at Santa Lucia, Salvador Ramirez; at Caucete, Ricardo Alvarez; and at 25 de Mayo, Ramon Echegaray.

The agricultural normal school at Santiago, Chile, is being reorganized and its activities devoted entirely to agricultural subjects under rules and regulations to be issued by executive authority. The agricultural schools at Chillan, Concepcion, and Cauquenes are also to be reorganized, and \$10,950 has been appropriated for each of two agricultural schools to be established at Aconcagua and Rancagua, respectively. An agricultural congress, an exposition of agricultural machinery, and a stock show are to be held in Concepcion during the latter part of October, 1913.

The government of Colombia has accepted eight scholarships, including four in the school of agriculture and one in the veterinary school of the University of Santiago, offered to Colombian students by the government of Chile.

The annual fair held in Guatemala from January 29 to February 2 was largely attended and fine exhibits of stock, agricultural products, fruits, vegetables, poultry, farm machinery, etc., were made. The school of agriculture of the Republic of Guatemala at Guatemala City, which was founded January 13, has admitted to its first year's class the first-year pupils of the Central Normal School for Males, thereby largely increasing the number of students taking the agricultural course.

The Haitian government has made an appropriation for the establishment of an agricultural school and negotiations are under way to engage professors from abroad to give instruction in the latest scientific agricultural methods.

In the meantime, the secretary of agriculture proposes the organization of a traveling school of agriculture and that instructors be sent from place to place in the coffee-producing regions to teach the producers how to improve their plantations, etc. He also proposes the establishment of experimental agricultural fields in the coffee and cacao producing regions to teach the farmers the rudiments of scientific farming. A bill was passed last July establishing an agricultural school in the Department of the West.

Rafael Bustillo has been appointed assistant director of the school for the cultivation of tobacco at Danli, Honduras. This school has a considerable number of students and under its influence the cultivation of tobacco in the Republic has greatly increased during the last few years.

Dr. A. Backhaus has submitted a plan to the department of agriculture of Paraguay for the founding of an agronomic institute in the country. An experiment station has been established by the government of Peru in the region of the Madre de Dios River with the special object of encouraging the scientific cultivation of rubber-producing trees indigenous to that section, and for the purpose of introducing and acclimatizing useful food-producing plants. Preparations are being made for an international exposition of agriculture, stock raising, and industry, to be held in the city of San Salvador in August. An executive decree of March 24 provides for the establishment of four meteorological stations in Venezuela at Merida, Ciudad Bolivar, Maracaibo, and Calabozo.

Agricultural Instruction in Grenada.—The Grenada Boys' Secondary School was opened on September 18, 1912, at St. George with 38 pupils, which number has since increased to 72. Agricultural instruction is to form a prominent feature of the curriculum, and by means of free scholarships to boys from the elementary schools and the cadet system of the agricultural department, it is planned to give a definite course of instruction in theoretical and practical agriculture.

Training Agricultural Experts in Spain.—A royal decree of April 11, 1913, provides for introducing instruction for the training of agricultural experts (*Peritos agricolas*) into the regional practical schools of agriculture at Valladolid and Zaragoza and the agricultural station at Albacete. The instruction is to be given in three courses, the first two to continue from October 1 to May 31, respectively, and the third, during the summer months, is to be devoted to farm practice. Students obtaining the title *Perito agricola* will be eligible to the position of assistant in the agricultural service.

Collegiate Country-Life Club for Rural Leadership.—It is announced that a national organization of the Collegiate Country-Life Club for Rural Leadership has been completed. The organization has grown out of a study originally carried on under the auspices of the Y. M. C. A. in which the problems of rural life and the relation to them of the college man was the chief subject of consideration. The purpose of the organization is to win college men and women to the farm, to interest them in the vitality of the life it offers, to show them the possibilities of leadership in rural affairs, and to inspire them to unite and work with the existing rural organizations.

The Training-School Idea in Agriculture.—In regard to training schools in agriculture, Dean L. H. Bailey, in his address before the rural education section of the New York State Teachers' Association, recently said in part:

"By eliminating the purposeless long vacation and maintaining a twelve months' enterprise, such training schools or classes might be combined with the existing public schools without loss of time to the pupil. These training-schools or training-classes should be many, to meet the needs of the different localities. They should be small units and strictly limited in the number of pupils so that each pupil may receive the maximum of actual hand-training. If

these training-schools or training-classes were to utilize actual farmers' farms for a part of their work the results, of course, would be much better. A vacation in the country is not farm work. Living in a country home is not farm work. One must actually do the work seriously and as good farmers do it. There should be some way of linking-up many of the best farms with the training-school idea, the educational features to be under the direction of the recognized educational authorities of the State."

Long Island Farm School.—It is stated in the *Tribune Farmer* that the Long Island agricultural school appropriation bill passed by the last session of the legislature provides for an appropriation of \$90,000 for the purchase of lands and \$300,000 for buildings in addition to the \$10,000 and \$40,000 previously appropriated, respectively, for lands and buildings. The trustees have received options on 300 acres of land about one and one-half miles from Farmingdale, N. Y.

Miscellaneous.—Among the appropriations of the General Education Board at its recent meeting are \$180,050 for agricultural demonstration work in the Southern States, including boys' corn clubs, \$75,000 for the promotion of girls' canning and poultry clubs in the South, \$14,500 for demonstration work in Maine, and \$7,500 for beginning similar work in New Hampshire.

A diploma has just been awarded to Dr. C. F. Langworthy, chief of nutrition investigations of this Office, for a collection of material illustrating nutrition and home economics, prepared for the International Hygiene Exhibition at Dresden in 1911.

Governor Cox of Ohio has announced as members of the new state agricultural commission A. P. Sandles, secretary of the State Board of Agriculture; S. E. Strode, state dairy and food commissioner; and Dean H. C. Price, of Ohio State University.

The new wing of the laboratories of the Rothamsted Experiment Station was formally opened June 27 by Hon. Walter Runciman, president of the Board of Agriculture and Fisheries.

The New York legislature has appropriated \$250,000 for a building for the forestry work at Syracuse University, together with \$50,000 for the maintenance and development of the work during the ensuing year.

James F. Zimmer, formerly in charge of the Insecticide Testing Laboratory of this Department at Vienna, Va., has accepted a position as assistant state leader in farm management with headquarters at Manistee, Mich.

Prof. Alexander G. McAdie, of the California district of the Weather Bureau of this Department, has accepted an appointment as professor of meteorology at Harvard University and director of the Blue Hill Observatory.

Frederick A. Ober, a graduate of the Massachusetts Agricultural College, and well known as an ornithologist and author, died recently at the age of 65 years.

The position of provincial entomologist in Nova Scotia has been established and W. Matheson appointed to the position.

ADDITIONAL COPIES of this publication
may be procured from the SUPERINTEND-
ENT OF DOCUMENTS, Government Printing
Office, Washington, D. C., at 15 cents per copy.
: : Subscription price, per volume, \$1 : :



EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director*.
Assistant Editor: H. L. KNIGHT.

EDITORIAL DEPARTMENTS.

Agricultural Chemistry and Agrotechny—L. W. FETZER, Ph. D., M. D.
Meteorology, Soils, and Fertilizers—W. H. BEAL.
Agricultural Botany, Bacteriology, and Vegetable Pathology {W. H. EVANS, Ph. D.
W. E. BOYD.
Field Crops {J. I. SCHULTE.
G. M. TUCKER, Ph. D.
Horticulture and Forestry—E. J. GLASSON.
Foods and Human Nutrition {C. F. LANGWORTHY, Ph. D., D. Sc.
H. L. LANG.
Zootechny, Dairying, and Dairy Farming—H. WEBSTER.
Economic Zoology and Entomology—W. A. HOOKER, D. V. M.
Veterinary Medicine {W. A. HOOKER.
L. W. FETZER.
Rural Engineering—R. TRULLINGER.
Rural Economics—B. B. HARE.
Agricultural Education—C. H. LANE.
Indexes—M. D. MOORE.

CONTENTS OF VOL. XXIX, NO. 3.

	Page.
Recent work in agricultural science	201
Notes	300

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Dynamic biochemistry or the chemistry of life processes, Fränkel	201
Physico-chemical tables, Castell-Evans	201
Studies in regard to gliadin, Schleimer	201
Formation of fats in oleaginous fruits, III, Scurti and Fornaini	201
Lectures on cellulose, Cross	201
The effect of alkalis, especially ammonia, upon peroxidase, Wolff	202
Is iron the catalyzer active in the oxidation of phenols by the peroxidase of the horseradish? Colin and Sénéchal	202
Studies in action of trypsin.—I, Hydrolysis of casein by trypsin, Walters	202
Method for obtaining natural soil solutions, Van Suchtelen	203
Efflorescence on lava bricks, McGeorge	203
New reduction methods in volumetric analysis, Knecht and Hibbert	203
Preparation of neutral solutions of ammonium citrate, Bell and Cowell	203
Food inspection and analysis, Leach	204
The detection of phytosterol in mixtures of animal and vegetable fats, Kerr	204
The detection of shells in cacao and its preparations, Ulrich	205
Pentose and methyl pentose determination in grapes and wines, von Fellenberg	205
Biological detection of castor bean constituents in feedings stuffs, Kranich	205
Detection of particles of castor seeds in feeding stuffs, Bierbaum	205
Milk testing, Walker-Tisdale	206
A rapid and exact method for counting leucocytes and bacteria in milk, Skar	206

	Page.
About Cornalba's figures in milk examinations, Leperre.....	206
Total solid and ash content of milk from cows with mastitis, Chrétien.....	206
About international methods for judging milk, Barthel and Jensen.....	206
Hygienic investigation of market milk, Gooren.....	207
Leather investigations, Veitch and Rogers.....	207
Sisal, McGeorge.....	208
Methods of manufacture and their influence on the maple product, Bryan....	208
Cider sickness, Barker and Hillier.....	208
Bacteria in wines and the changes produced, Müller-Thurgau and Osterwalder	209
The yearly reports of the society of alcohol manufacturers of Germany.....	209

METEOROLOGY—WATER.

Report of the Chief of the Weather Bureau, 1912.....	209
Climatic measurements, Schollander.....	209
Climatic measurements, Schollander and Whitcomb.....	209
The fertilizing value of rain and snow, Shutt.....	209
Geology and underground waters of north-central Texas, Gordon.....	209
Surface water supply of Seward Peninsula, Alaska, Henshaw, Parker, et al....	210
The water supply of farm homesteads, Shutt.....	210
The purification of public water supplies, Johnson.....	210

SOILS—FERTILIZERS.

Soils, McGeorge.....	210
Soil tank investigations, Collison.....	211
Tank experiment for 1910, Schollander.....	211
Moisture conservation by tillage and cropping, Schollander and Whitcomb....	211
Nitrogen enrichment of soils, Shutt.....	211
The intensity of nitrification in arid soils, Stewart.....	211
The fixation of nitrogen by so-called zeolites, Wiegner.....	211
On the relation of plants to soils, Canavari.....	212
The plant as indicator of relative density of soil solutions, Lyon and Bizzell....	212
The action of frost on soils, Ehrenberg and von Romberg.....	212
Sunlight, McGeorge.....	212
Maintenance of soil fertility: Plans and summary tables.....	213
The relation of fertilizers to soil fertility, Guthrie.....	213
Importance of place in rotation at which fertilizers are applied, Warren.....	213
Some business questions in the interpretation of fertilizer tests, Warren.....	213
Practical suggestions about the purchase of commercial fertilizers, Voorhees....	213
Yearbook of fertilizers and chemical products used in agriculture, Lambert....	213
Importance of the South in the production and consumption of fertilizers....	213
Tests with four nitrogenous manures.....	213
Calcium nitrate, Dafert and Miklausz.....	214
Norwegian nitrate, von Seelhorst and Simmermacher.....	214
Burkheiser salt, a nitrogenous fertilizer, Wieler.....	214
The use of phosphates in Victorian agriculture, Paterson and Scott.....	214
Occurrence of potassium salts in salines of United States, Turrentine et al....	214
The extraction of potassium salts from silicate rocks, Hancock.....	215
The importance of potash in feldspars for plants, Blanck.....	215
Action of ground phonolite in several years' fertilizer experiments, Waguer....	215
Kainit as a means of combating weeds, Dettweiler.....	215
The use of lime on land, Gardner.....	215
Influence of sulphur on growth of potatoes and beets, Chancrin and Desriot....	215
Recent experiments on the fertilizing action of sulphur, Desriot.....	215
A green manure for tobacco, Bamber.....	215

AGRICULTURAL BOTANY.

Syllabus of plant families, Engler and Gilg.....	216
A list of plants growing without cultivation in Massachusetts, Stone.....	216
A possible means of identifying sex in the mucors, Blakeslee.....	216
Inheritance of certain characters in groundsel and its segregates, Trow.....	216
Inheritance of flower size in crosses between species of <i>Nicotiana</i> , East.....	216
Abnormal root formation by potato, Schlumberger.....	217
Spontaneous detachment of twigs of some trees, De Vilmorin and Hickel.....	217
Significance of the structure of the tracheids of conifers, Bailey.....	217

	Page.
Chondriosomes in living plant cells, Maximow.....	217
Studies on water conduction by dicotyledonous leaves, Rippel.....	217
The resistance offered by leaves to transpirational water loss, Livingston.....	217
Photochemical effects from mercury vapor lamp and sunlight, Kluyver.....	218
Light as a factor inducing plant succession, Gates.....	218
The mode of action of weak solutions of electrolytes on germination, Micheels..	218
Limits of germination of seeds after being placed in salt solutions, Lesage.....	218
Effects of using salt solutions for watering and sprinkling plants, Kuijper.....	218
Displacement by water of nitrogenous and mineral materials in leaves, André..	218
Effect of some nitrogenous soil constituents on growth, Schreiner and Skinner..	219
The significance of sugar in the tubers of <i>Solanum tuberosum</i> , Butler.....	219
Rôle of manganese in production of conidia of <i>Aspergillus niger</i> , Bertrand....	219
The influence of boron compounds on plant growth, Haselhoff.....	219
Rôle of oxidases in formation of anthocyanin pigments, Keeble and Armstrong..	219
On the presence of diastase in certain red algae, Bartholomew.....	220
An optimum culture medium for a soil fungus, Pollock.....	220
Studies in bacteriological analysis of Indian soils, I, 1910-11, Hutchinson.....	220
On Actinomycetes in soils, Münster.....	222
Hypertrophied action of products elaborated by <i>Rhizobium radicicola</i> , Molliard..	222
An efficient electrical incubator, Conn and Harding.....	222

FIELD CROPS.

[Field crops work at Canadian stations and farms in 1911], Grisdale et al.....	222
[Field crop experiments], Scott.....	224
Report of the agronomist, McClelland.....	224
Growing crops in western Nebraska, Snyder and Burr.....	225
[Field crops work at the Williston substation, 1910], Schollander.....	225
[Field crops work at the Williston substation, 1911], Schollander.....	226
Agriculture on the Yuma reclamation project, Scofield.....	226
The Rothamsted Experiment Station, 1843-1911, Hall.....	226
[Variety and manurial experiments in Ireland], Wilson.....	228
Variety test with oats, wheat, beans, and beets, Merkel.....	228
[Wheat, oats, and potato tests], Despeissis.....	228
Report of Dumraon Experimental Station, 1911-12, Sherrard.....	228
Legume inoculation, Prucha.....	228
Report of assistant botanist, Belling.....	228
Effects of cross-pollination on size of seed in maize, Collins and Kempton.....	229
Corn production, Center.....	229
Grow corn that will ripen, Shepperd.....	229
The wild prototype of the cowpea, Piper.....	229
A comparison of Mammoth and Spanish peanuts in central Iowa, Clark.....	230
Good seed potatoes and how to produce them, Stuart.....	230
Changes in Irish potatoes during storage, Appleman.....	230
The determination of sulphur and chlorin in the rice plant, Thompson.....	231
Sudan grass, a new drought-resistant hay plant, Piper.....	233
Instructions for conducting comparative experiments with sugar beets, Zaleski..	233
The world's sugar production, with statistics, Ziegler.....	233
Fertilizer experiments with taro, McGeorge.....	233
Quebec experimental tobacco stations, 1911, Chevalier.....	233
The culture of tobacco in Gironde, Trichereau.....	233
Vetch growing in the South Atlantic States, Smith.....	233
Durum wheat, Salmon and Clark.....	233

HORTICULTURE.

Report of the horticulturist, Higgins.....	234
[Horticultural work at Canadian stations and farms, 1912], Grisdale et al.....	235
Report of the assistant horticulturist, Hunn.....	235
Report of the horticultural testing fields from 1907 to 1911, Bonthuis.....	235
Tin cans versus pots for seedling plants, Wilcox.....	236
Suggestions on preparation and use of spray formulas, Bentley.....	236
The composition of irrigated and nonirrigated fruits, Jones and Colver.....	236
[Orchard and small fruits], Schollander.....	237
Apples and peaches in the Ozark region, Gould and Fletcher.....	237
[Citrus experiments], Collison.....	237

	Page.
Late pruning, Ravaz.....	238
Experience on reconstitution of vineyards with American stocks, Pantanelli..	238
The Muscadine grapes, Husmann and Dearing.....	238
Coffee manuring on a scientific basis, Wilkins.....	239
Flower gardening, Adams.....	239
Rogues in sweet peas, Hurst.....	239

FORESTRY.

Second annual report of the state forester, Cox.....	239
What Michigan is now doing in regard to forest fire protection, Oates et al.....	239
Report of the superintendent of forestry, Hosmer.....	239
Report of the forest nurseryman, Haughs.....	239
Report of the consulting botanist, Rock.....	239
Progress report of forest administration in Coorg for 1911-12, Tireman.....	239
Forest administration of the Grand Duchy of Baden for the year 1911.....	239
On the relation between forests and ground water, Trabucco.....	240
The true selection system, Channer.....	240
Anatomical investigations on Japanese and related coniferous seeds, Kondo...	240
A contribution to the methods of regenerating pine stands, Schwappach.....	240
Influence of early thinning on regular stands of spruce, Mer.....	240
Norway spruce during the summer of 1911, Maire.....	240
Wood-using industries of New Hampshire, Simmons.....	240
The lumber estimator, Leaver.....	240
Note on treatment of sleepers at Pyinmana by the forest economist, Pearson...	240
Preliminary notes on tapping experiments at Kuala Lumpur, Spring.....	240
Tapping experiments with <i>Hevea brasiliensis</i> , Simon.....	240
Report of the superintendent of the rubber substation, Anderson.....	241
[Analyses of Hawaiian rubber], McGeorge.....	241
Wild lettuce rubber, Fox.....	241

DISEASES OF PLANTS.

Report of the Dominion botanist, Güssow.....	242
Report of the plant pathologist, Stevens.....	242
Report of assistant plant pathologist, Burger.....	242
Report of division of vegetable pathology, May-December, 1911, Aversa-Saccá..	243
Parasitic wilt diseases of cultivated plants due to fungi, Wollenweber.....	243
Causes which determine infertility of the soil and loss of crops, Jachevski....	243
Infection studies with red fruited mistletoe (<i>Viscum cruciatum</i>), von Tubeuf...	243
Sterilization of seeds, Pinoy and Magrou.....	243
Infection of grain by <i>Fusarium</i> and its significance, Schaffnit.....	244
Snow molds, Voges.....	244
A disease of cereals in Russia, Vassiliev.....	244
Smut experiments at the state farm, Bungeworgorai, Soutter.....	244
Combating grain smuts, Müller.....	244
A hybrid wheat resistant to rust, Génin.....	244
Cucumber wilt, Hanzawa.....	245
Onion smut, Reddick.....	245
Diseases of rice and of onions, Ramirez.....	245
A new bacterial disease of <i>Pisum sativum</i> , Cayley.....	245
<i>Cystopus candidus</i> on broad leaved pepperwort (<i>Lepidium latifolium</i>), Noffray..	245
Field studies of a leaf-roll disease of potatoes, Fitch.....	246
Noteworthy communications regarding sugar beet diseases in 1912, Stift.....	246
Vegetable parasites of tomato, Finardi.....	246
A rot of tomato caused by <i>Phytobacter lycopersicum</i> n. sp., Groenewege.....	246
Natural resistance to disease in fruits, Hedrick.....	246
Bitter pit in apples.....	246
Apple scab situation, Reddick.....	247
<i>Trichoseptoria fructigena</i> , a disease of quinces and apples, Pietsch.....	247
A momentous discovery for fruit growers, Walker.....	247
Report of former plant pathologist, Fawcett.....	247
Report of plant physiologist, Floyd.....	248
Experiments on the decay of Florida oranges, Grossenbacher.....	248
Black rot of the navel orange, Amundsen.....	248
Investigations of cacao canker, Rutgers.....	248

	Page.
Lime-sulphur wash for American gooseberry mildew, Salmon and Wright.....	249
Recent observations on downy mildew, Chrestian.....	249
A disease of lilac (<i>Phytophthora syringæ</i>) new in Netherlands, Schoevers.....	249
Pine blister rust and currant felt rust, Stewart.....	249
<i>Physalospora latitans</i> attacking <i>Eucalyptus rostrata</i> , Avena-Saccá.....	250
A <i>Fusicladium</i> disease of Hevea, Kuijper.....	250

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The fauna of the Hawaiian Islands, edited by Sharp.....	250
Report of entomologist, Watson.....	251
Insect notes for 1912, Johannsen.....	251
The principal insects injurious to agriculture during 1911-12, Swenk.....	252
New destructive insects in New York, Parrott.....	252
Report of the Dominion entomologist, Hewitt.....	252
Report of the entomologist, Fullaway.....	252
Some external insect parasites of domestic fowls, Herrick.....	253
Further data on heat as a means of controlling mull insects, Dean.....	253
Zinc arsenite as an insecticide, Schoene.....	253
The hop aphid in the Pacific region (<i>Phorodon humuli</i>), Parker.....	254
Two new Coccidæ, Cockerell.....	255
The date palm scales and their control, Wilsie.....	255
Controlling gipsy moth by removing favorite food plants, Burgess and Rogers....	255
Spruce bud worm and spruce leaf miners, Johannsen.....	255
The stable fly (<i>Stomoxys calcitrans</i>), an important live stock pest, Bishop.....	256
Work on the Mediterranean fruit fly in Hawaii, Weinland.....	257
The Mediterranean fruit fly in the Hawaiian Islands, Severin.....	257
The flight of 2,000 male Mediterranean fruit flies, Severin and Hartung.....	257
Danger of introducing Mediterranean fruit fly into United States, Severin.....	257
The wheat leaf miner (<i>Agromyza parvicornis</i>), Houser.....	257
<i>Chilocorus similis</i> and its relation to scale insects in Japan, Nakayama.....	258
Potato flea beetle (<i>Epitrix cucumeris</i>), Johannsen.....	258
The potato flea beetle.....	259
The control of the alfalfa weevil, Titus.....	259
Notes on the rice water weevil and its control, Newell.....	259
The raspberry horn-tail (<i>Hartigia abdominalis</i>), Essig.....	260
On the feeding habits of <i>Pimpla (Itopectis) conquisitor</i> , Johnston.....	261
The red spider on hops in the Sacramento Valley of California, Parker.....	261
Some natural enemies of spiders and mites, Quayle.....	262
The effects of spraying, Fawcett.....	262
A tick the probable carrier of verruga, Townsend.....	262
The possible and probable etiology and transmission of verruga fever, Townsend.....	262

FOODS—HUMAN NUTRITION.

Minnesota wheat investigations, 1911, Bailey.....	262
Influence of environment on milling and baking qualities, Howard et al.	263
Processes of flour manufacture, Amos.....	263
Grain germ as food, Boruttau.....	263
The occurrence of nicotinic acid in rice bran, Suzuki and Matsunaga.....	263
Composition of different varieties of red peppers, Tolman and Mitchell.....	263
The induction of nonastringency in persimmons, Lloyd.....	264
Soaking nuts, Frehse.....	264
Manufacture of preserved foods, Hausner, trans. by Morris and Robson.....	264
The question of sulphurous acid in white wines, Malvezin.....	264
Table luxuries, Grotjahn and Kaup.....	265
The gases evolved from roasted coffee, their composition and origin, Gould....	265
Elimination and toxicity of caffeine in rabbits, Salant and Rieger.....	265
The influence of caffeine on mental and motor efficiency, Hollingworth.....	265
Effect of preservative containing benzoic acid on chopped meat, Mezger et al.....	266
American pure food and drug laws, Westervelt.....	266
Thirteenth report on food adulteration under the pure food law, Allen et al. ...	266
[Food, drug, and dairy inspection], Strode.....	266
[Inspection of foods, drugs, dairy products, and agricultural seeds], Davies....	266
Report of the department of food and drugs control for 1912, Codd and Dinsmore.....	266
Report of department of weights and measures for 1912, Codd and Dinsmore.....	266

	Page.
Nutrition, Grotjahn and Kaup.....	266
Food consumption and female labor, Brandt-Wyt.....	266
Committee on school lunches of the Home and School League, Bonnell et al. .	267
Health and longevity through rational diet, Lorand.....	267
Problems of physiological and pathological chemistry, von Fürth.....	267
Studies on water drinking, XIV, Bergeim and Hawk.....	267
Physiology of intestine.—III, Absorption of mono and disaccharids, Lombroso..	268
Alkalinity of pancreatic and intestinal juices of dogs, Auerbach and Pick.....	268
Experiences with duodenal and stool ferments in health and disease, Crohn...	268
Effect of sodium chlorid and cold storage on proteolytic enzymes, Berg.....	268
Utilization of individual proteins as influenced by fasting, Howe and Hawk...	268
Fatty acid esters of glucose, Bloor.....	269
Pharmacological effects of compounds of sulphurous acid, Rost and Franz.....	269
Fermentative processes in cereals and diseases arising from them, Kohlbrugge..	269
Infantile beri-beri, Andrews.....	270
Nutrition laboratory, Benedict.....	270

ANIMAL PRODUCTION.

Fodders and feeding stuffs, Shutt.....	270
Silos, silage, and silage crops for Hawaii, McClelland.....	270
[Analyses of fern tree trunks and soy-bean cake], Wilcox.....	270
Fish meal as food for stock.....	270
Concentrated commercial feeding stuffs, Turner and Spears.....	270
[Analyses of feeding stuffs], Rose.....	271
Animal husbandry, Corsa et al.....	271
Experiments with live stock, Grisdale et al.....	271
Feeding for beef in central Alberta, Hutton.....	272
Report of the animal industrialist, Scott.....	272
Experiments with coconut cake, wheat bran, and linseed cake, Bruce.....	272
Notes on cattle breeding, Simmons.....	273
Prospects for importation of cattle from Australia, Nobbs.....	273
Rambouillet sheep in France, Ashton.....	273
Horse breeding, Anstruther.....	273
Report of the poultry manager, Gilbert.....	273
Methods of chick feeding, Nixon.....	273
Report of the poultry expert, Laurie.....	275
Poultry [records], Seton.....	276
The care of the farm egg, Lamon and Opperman.....	276
Farm poultry, Willey et al.....	276

DAIRY FARMING—DAIRYING.

[Feeding cows and calves], Hooper.....	276
Effect of heavy root feeding on milk, Lauder and Fagan.....	277
On the feeding value of legumes for milk production, Hansson.....	277
Influence of legumes on the quality of butter, Rosengren.....	278
Cost of food in the production of milk, Crowther.....	278
[Dairy herd records], Grisdale and Moore.....	278
English Guernsey cattle society's milk records.....	278
Danish milk control, Dunne.....	278
The histological appearances of the udder, Hewlett et al.....	278
Milk analysis, Pappel.....	278
On the fat content of human milk, Arnold.....	278
A study of the udder flora of cows, Harding and Wilson.....	279
Studies of long stiffs forms of lactic acid bacteria (lactobacilli), Barthel.....	279
Factors affecting the bacteriological content of milk, Lauder and Cunningham	279
The milk supply of Milwaukee and its control, Gunn.....	280
Sterilization of milk and butter, Gautier.....	280
Report of dairy expert, Suter.....	280
[Ferment serum], Fascetti.....	280

VETERINARY MEDICINE.

Stock poisoning due to scarcity of food, Marsh.....	280
Larkspur, or "poison weed," Marsh, Clawson, and Marsh.....	280

	Page.
Field horsetail (<i>Equisetum arvense</i>), Güssow.....	281
Diagnosing infections with the Preisz-Nocard bacillus, Forgeot and Cesari.....	281
Diagnosing anthrax with bone marrow, Wulff.....	281
Epizootic abortion in the mare, Dassonville and Rivière.....	281
Persistence of <i>B. abortus</i> in tissues of inoculated animals, Fabyan.....	282
A note on the presence of <i>B. abortus</i> in cow's milk, Fabyan.....	282
Excretion of abortion bacillus in milk of infected animals, Zwick and Krage ..	282
The destruction of the virus of foot-and-mouth disease in manure, Loeffler.....	283
Influence of subcutaneous mallein test on examination of the blood, Marcis....	284
The laboratory diagnosis of glanders, Wade.....	284
The pathologic anatomy of chronic diarrhea in bovines, Moussu and Faroy.....	284
Present status of vaccination against coast fever, Wölfel.....	284
The comparative pathogenicity of John's bacillus, Twort and Craig.....	285
In regard to our knowledge of Malta fever, Izar.....	285
Experiments on the efficiency of antirinderpest serum, Ward and Wood.....	285
Use of antiformin for detecting open tuberculosis, Schmitt and Pröscholdt.....	285
Tissues rich in tuberculous granulation as antigens, Gaucher et al.....	285
Fowl tuberculosis, so-called fowl leukemia, and normal fowl blood, Burckhardt ..	285
Prevalence of human and bovine types in bone and joint tuberculosis, Fraser..	286
The early stages of tuberculosis in bovines, Joest and Kracht-Palejeff.....	286
Combating tuberculosis among bovines in barns, von Arnim.....	286
The repression of tuberculosis in dairy herds, Stewart.....	287
Action of arsenical dips in protecting cattle from ticks, Graybill.....	287
[Epidemic interstitial pulmonary emphysema in milch cows], Knese.....	287
Hookworm disease in sheep and other animals.....	287
Fixed hog cholera virus, Reichel.....	287
A typhoid-like disease in rabbits caused by <i>Bacillus suispesticus</i> , Ordway et al...	288
Bacillary white diarrhea of young chicks, Rettger et al.....	288

RURAL ENGINEERING.

Civil engineer's pocketbook, Frye.....	289
Facts, figures, and formulas for irrigation engineers, compiled by Buckley.....	289
Ninth biennial report of state board of irrigation, highways and drainage.....	289
Seepage losses in irrigation systems, Hopson.....	289
Earth reservoir dams, Meyers.....	289
Yakima Indian Reservation drainage project, Martin.....	289
The drainage experimental field in Josephsdorf, Krüger.....	290
United States Government specifications for Portland cement.....	290
Specifications for drain tile and sewer pipe, Marston, Dean, and Warrington...	290
Studies of coefficient of friction in reinforced concrete pipe, Newell.....	290
Concreting in cold weather.....	291
Papers, addresses, and resolutions before the American Road Congress.....	291
Proceedings of third convention of Inter-Mountain Good Roads Association...	291
Proceedings of tenth meeting of Ontario Good Roads Association, 1912.....	291
Jacket water requirements of internal combustion engines, Trautschold.....	292
Reciprocating pump curves, Daniels.....	292
Slippage of reciprocating pump, Baer.....	292
New features in construction and operation of plowing implements, Gisevius..	292
Report of tests of potato sprayers, Lako et al.....	292
The army horseshoe.....	292
[Plans for the construction of a swine-fattening establishment], von Braun....	292
How to build a "hendwel" to house 1,000 hens, Lawry.....	293
Improved New York gasoline-heated colony-house brooding system, Rogers.....	293
A new type of sewage sedimentation tank, Mount Washington, Md., Oliver...	293
Mosquito extermination and its problems, Winship.....	293

RURAL ECONOMICS.

The farmer of to-morrow, Anderson.....	293
Farm accounts, Orwin.....	293
Commerce and products of agriculture, Poher.....	293
The problem of agricultural distribution, Butterfield.....	294
Marketing farm products, Spillman.....	294
Farmers' selling agencies, Tenney.....	294
Organizations for furthering agriculture, Kiessling.....	294

	Page.
Rural credits—cooperative finance, O'Neal.....	294
Farmers' cooperative banks, Tomkins.....	294
A farmers' cooperative company that inspired a state law.....	294
The country church and community cooperation, edited by Israel.....	294
Notes on agricultural conditions in Denmark, Egan.....	295
Cost of living [in Bavaria], Peters.....	295
Report of commission on the cost of living in New Zealand.....	295
[Agricultural] production.....	295
Crop Reporter.....	296
Foreign crops, March-April, 1913, Daugherty.....	296

AGRICULTURAL EDUCATION.

Work of Massachusetts Agricultural College for schools of Massachusetts, Hart..	296
Second annual report of the School Garden Association of America.....	296
Report on the qualification of teachers of rural subjects.....	296
Report on manual instruction in rural elementary schools.....	297
Agricultural education in Prussia.....	297
[Agriculture for teachers].....	297
[Agricultural instruction for the teachers of Porto Rico].....	297
High school agriculture, Mayne and Hatch.....	298
Laboratory exercises in secondary school agriculture, 1912, Boston.....	298
Household bacteriology for students in domestic science, Buchanan.....	298
Syllabus for holiday course for teachers of nature study, 1913.....	298
High school extension in agriculture, Whitney.....	298
Educational contests in agriculture and home economics, Christie.....	299
Recent books for the farm home, Green.....	299

MISCELLANEOUS.

Annual Report of Florida Station, 1912.....	299
Annual Report of Hawaii Station, 1912.....	299
Third Annual Report of the Williston Subexperiment Station, 1910.....	299
Fourth Annual Report of the Williston Subexperiment Station, 1911.....	299
Experiment Station Work, LXXV.....	299
Monthly Bulletin of the Department Library, March-April, 1913.....	299

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

Stations in the United States.

	Page.
Connecticut Storrs Station:	
Bul. 74, Dec., 1912.....	288
Florida Station:	
An. Rpt. 1912.....	211,
224, 228, 237, 242, 247,	
248, 251, 262, 272, 299	
Hawaii Station:	
Press Bul. 40, Apr. 1, 1913....	270
Press Bul. 41, Apr. 1, 1913....	236
An. Rpt. 1912.....	203,
208, 210, 212, 224, 231, 233,	
234, 235, 241, 252, 270, 299	
Idaho Station:	
Bul. 75, Aug., 1912.....	236
Kentucky Station:	
Bul. 170, Jan., 1913.....	270
Bul. 171, Apr. 1, 1913.....	276
Maine Station:	
Bul. 207, Dec., 1912.....	251
Bul. 210, Feb., 1913.....	255
Bul. 211, Mar., 1913.....	258
Doc. 467, Feb., 1913.....	259
Maryland Station:	
Bul. 167, May, 1912.....	230
Minnesota Station:	
Bul. 131, Apr., 1913.....	262
Nebraska Station:	
Bul. 135, Apr. 1, 1913.....	225
Nevada Station:	
Rpt. Dept. Food and Drugs	
Control, 1912.....	266
Rpt. Dept. Weights and Meas-	
ures, 1912.....	266
New York Cornell Station:	
Bul. 327, Feb., 1913.....	273
Circ. 15, Mar., 1913.....	228
Circ. 16, Mar., 1913.....	293
New York State Station:	
Tech. Bul. 27, Mar., 1913.....	279
Tech. Bul. 28, Mar., 1913.....	253
Tech. Bul. 29, Mar., 1913.....	222
North Dakota Station:	
Third An. Rpt. Williston	
Substa., 1910....	209, 211, 225, 299

Stations in the United States—Continued.

	Page.
North Dakota Station—Continued.	
Fourth An. Rpt. Williston	
Substa., 1911.....	209,
211, 226, 237, 299	
Ohio Station:	
Bul. 251, Sept., 1912.....	257
Circ. 131, Feb. 25, 1913.....	213
Tennessee Station:	
Bul. 99, Apr., 1913.....	236
Utah Station:	
Circ. 10, Mar., 1913.....	259
<i>U. S. Department of Agriculture.</i>	
Farmers' Bul. 529.....	233
Farmers' Bul. 531.....	280
Farmers' Bul. 532.....	299
Farmers' Bul. 533.....	230
Farmers' Bul. 534.....	233
Farmers' Bul. 536.....	280
Bureau of Animal Industry:	
Bul. 160.....	276
Bul. 167.....	287
Circ. 212.....	204
Bureau of Chemistry:	
Bul. 163.....	263
Bul. 165.....	207
Bul. 166.....	265
Bureau of Entomology:	
Bul. 111.....	254
Bul. 117.....	261
Bureau of Plant Industry:	
Bul. 273.....	238
Bul. 275.....	237
Circ. 124.....	226, 229, 248
Circ. 125.....	233
Bureau of Soils:	
Bul. 94.....	214
Bureau of Statistics:	
Circ. 47.....	296
Crop Reporter, vol. 15, No. 5,	
May, 1913.....	296
Weather Bureau:	
Rpt. 1912.....	209
Office of Experiment Stations:	
Bul. 255.....	299
Library:	
Mo. Bul., vol. 4, Nos. 3-4,	
Mar.-Apr., 1913.....	299



EXPERIMENT STATION RECORD.

VOL. XXIX.

ABSTRACT NUMBER.

No. 3.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Dynamic biochemistry or the chemistry of life processes, S. FRÄNKEL (*Dynamische Biochemie. Chemie der Lebensvorgänge. Wiesbaden, 1911, pp. XI+600*).—The contents of this book are as follows: Physical and chemical processes occurring in tissues; special chemical changes in the organism; ferments; digestion; resorption; assimilation; metabolism; chemical functions of individual organs, as the liver, etc.; internal secretions; sex; chemical functions of certain organs; blood; and immuno-chemistry.

Physico-chemical tables, J. CASTELL-EVANS (*London, 1911, vol. 2, pp. XIV+549-1235*).—This is the second volume of this large compilation of tables, which is meant for analysts, physicists, chemical manufacturers, and scientific chemists. It deals with physical and analytical chemistry. The previous volume was devoted to chemical engineering, physics, and chemistry.

Studies in regard to gliadin, the alcohol soluble portion of wheat gluten, A. SCHLEIMER (*Ztschr. Gesam. Getreidew., 3 (1911), No. 6, pp. 138-140; abs. in Chem. Ztg., 36 (1912), No. 48, Repert., p. 240*).—The solubility of gliadin in ethyl alcohol is dependent upon the concentration of the latter, being most soluble in a 55 per cent solution, as noted by Hoagland (*E. S. R., 27, p. 111*). It is somewhat less soluble in methyl alcohol and more soluble in propyl alcohol (40 per cent).

Formation of fats in oleaginous fruits.—III, Investigation of the leaves of the Japanese privet, F. SCURTI and M. FORNAINI (*Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 5 (1911), pp. 223-239*).—This is a continuation of the work previously noted (*E. S. R., 26, p. 801*) in which the oleanol of the olive and the ligustrol of the privet were displaced by fatty acids and finally by neutral fats. The leaves, on extraction with ether extract, were found to contain ligustrol, besides other substances.

Lectures on cellulose, C. F. CROSS (*London, 1912, pp. 52*).—These are the lectures on cellulose given before the Institute of Chemistry of Great Britain and Ireland, and intended especially for the younger members of the institute.

The topics dealt with are as follows: Cellulose and derivatives; prototypes of colloids; colloids; preponderating importance of colloids; investigations of colloids, and colloidal state, hitherto mainly "two dimensional;" the "normal cellulose" and normal processes of preparation; significance in science and industry; "systematic chemistry of cellulose" on half-sheet of note paper; specialist literature of cellulose, of library dimensions; meaning of this relation; ligno-celluloses; constitution; methods of resolution; wood celluloses; by-products, and utilization, illustrative of chemist's balance sheet of industrial

processes; special study of chlorination process as a quantitative method; problem of adaptation to industrial requirements as a typical investigation; starch, "feculose," and the true starch colloid; permanent aqueous solutions; applications; hemi-celluloses from seed-endosperms; tragacanth, industrial applications; cutiloid, a new colloid; applications in paper and leather industries; cellulose hydrate; hydration by chemical reaction; by mechanical treatment; paper-making beating process in relation to properties of paper; some margins of industrial value; dyeing processes in relation to chemical-colloidal constitution; cellulose hydrates as basis of artificial structural forms; form and dimensions; practical histology in chemical investigations; physical investigations of colloidal state by way of starch-cellulose series; cellulose and industrial supply; wood cellulose and forestry; further utilization of world's wastes; and examples of wastes on a colossal scale.

The effect of alkalis, especially ammonia, upon peroxidase, J. WOLFF (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 9, pp. 484-486).—The source of this enzym was sprouted barley seeds, and the substance to be oxidized in the presence of hydrogen peroxid was guaiacol.

The results show that in the presence of ammonium hydrate the peroxidase from the above source loses much of its activity, but if the mixture is shaken it gains in activity in about 4 to 5 hours. The activity continues to increase and reaches its maximum, about twice the initial activity, in 14 hours and retains it for some time. On the eleventh day the intensity of the reaction is very weak and is comparable with that obtained when ammonia is added.

A decinormal solution of sodium hydrate gives analogous results but the destruction of the catalyzer is much more rapid than with a normal solution of ammonia.

Is iron the catalyzer active in the oxidation of phenols by the peroxidase of the horseradish? H. COLIN and A. SÉNÉCHAL (*Compt. Rend. Acad. Sci. [Paris]*, 154 (1912), No. 4, pp. 236, 237; *abs. in Zentbl. Physiol.*, 26 (1912), No. 17, p. 746).—It appears that the active principle of peroxidase is a complex compound which contains only small amounts of iron in its molecule and with a strong resemblance to hemoglobin.

Studies in the action of trypsin.—I, On the hydrolysis of casein by trypsin, E. H. WALTERS (*Jour. Biol. Chem.*, 11 (1912), No. 4, pp. 267-305, figs. 2).—"The experiments may be briefly summarized as follows:

"The method of estimating the velocity with which a protein (casein) is hydrolyzed by determining the nitrogen in the undigested portion after precipitation with acetic acid yields results admitting of an accurate physico-chemical interpretation.

"Upon the addition of a slight excess of alkali to neutral or faintly alkaline solutions of casein immediately before precipitation with acetic acid, precipitation is hastened and a clear filtrate is assured. The relation between the time of hydrolysis and the amount of basic sodium casein hydrolyzed, is, for all stages of the reaction, what we would be expected from the monomolecular formula $\text{Log } 10 \frac{a}{a-x} = Kt$.

"The velocity with which basic sodium caseinate is hydrolyzed by trypsin is directly proportional to the concentration of the ferment. There is a general proportionality between the concentration of the substrat and the velocity of hydrolysis, although the velocity constant decreases slightly as the concentration of the substrat increases.

"The nature of the base combined with casein has little or no influence in the process of hydrolysis. Basic caseinates of Li, Na, K, NH₄, Ca, Sr, and Ba hydrolyze with approximately equal velocities for all concentrations of sub-

strat between 0.4 and 2 per cent. There is no relation between the degree of dissociation and the rate with which basic caseinates are hydrolyzed by trypsin, as in the solutions employed the caseinates of the alkalis are almost completely dissociated, while the caseinates of the alkaline earths are only about 50 per cent dissociated, yet both series of 'salts' are hydrolyzed by trypsin at approximately the same velocity. There is evidence of rapid autohydrolysis in solutions of neutral and basic caseinates of the alkalis and alkaline earths."

Method for obtaining natural soil solutions, F. H. H. VAN SUCHTELEN (*Jour. Landw.*, 60 (1912), No. 4, pp. 369, 370).—For preparing a soil solution for bacteriological purposes which will represent natural conditions, the following procedure is recommended:

A stratum of fairly moist soil having a known moisture content is spread over a nonhygroscopic asbestos layer previously washed with ether and dried, contained in a large Büchner filter. The soil is pressed down slightly with a rubber stopper, cooled paraffin oil is then poured over it until it is entirely covered, and a suction pump connected to produce a gentle suction. The fluid obtained in the flask of the suction pump is heated to 40° C. to reduce the viscosity and enhance the separation of the fluids, transferred to a pointed glass, and centrifuged. The watery solution is then drawn off and used for the purpose intended. The paraffin oil, free from bubbles, can be used again.

The soil water displaced by the oil, according to the author's experiments, constitutes about 50 per cent of the total water capacity of the soil.

This work will be reported on more fully in a later publication.

Efflorescence on lava bricks, W. McGEORGE (*Hawaii Sta. Rpt.* 1912, p. 59).—An efflorescence was noted on bricks made from ground lava rock, which in some cases made the brick walls appear as though they had been in the path of a snowstorm. The efflorescence was found to be composed of the carbonates or bicarbonates of sodium and potassium.

"The brick are made by pressing the ground rock after a slight addition of lime and dampening of the mixture. They are then dried under steam pressure. The conclusion reached was that the lime and the subsequent drying temperature cause the trouble. Sodium and potassium carbonates are not normal products of lava disintegration, although some of the vesicles in lava rock contain a coating of carbonate. Potassium and sodium occur in basaltic lava in the form of complex silicates. The lime at the temperature of the drying kiln probably replaces the sodium and potassium in these silicates and forms caustic soda and potash, which in turn are converted on contact with the air into carbonates and bicarbonates."

New reduction methods in volumetric analysis, E. KNECHT and EVA HIBBERT (*London, New York, and Bombay, 1910, pp. X+108, figs. 3*).—This contains a series of analytical methods, almost all of which have been published in other journals.

The methods for organic substances are for nitro compounds, azo compounds, dyestuffs which yield colorless leuco compounds, sugars, coloring matters in dyed cotton fabrics, etc. Methods are also included for inorganic substances such as hydrogen peroxid and certain per-acids, chlorates, perchlorates, nitrates, hydroxylamin, oxygen in water, and hydrosulphites."

Methods for the preparation of neutral solutions of ammonium citrate, J. M. BELL and C. F. COWELL (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 1, pp. 49-54, figs. 2).—After pointing out the advantages to be derived by using the conductivity method (E. S. R., 26, p. 709; 27, p. 110), 2 further methods are presented for determining the neutral point of ammonium citrate solution, neither of which requires careful regulation of the temperature.

"In one method there is an indirect determination of the excess of ammonia just past the neutral point by the use of chloroform as solvent. This method is called the 'extraction method.' The second method, like the conductivity method, is a physical method, depending on the great heat evolution when ammonia and citric acid solutions are mixed. This has been called the 'temperature method.'"

Food inspection and analysis, A. E. LEACH (*New York and London, 1913, 3. ed., rev. and enl., pp. XIX+1001, pls. 40, figs. 120*).—The third edition of this well-known work (E. S. R., 22, p. 411) has been revised and enlarged.

"Among the new features are improved general methods and apparatus for the determination of moisture, ash, and arsenic, modern apparatus for the Babcock test, processes for the detection of foreign fat in dairy products, methods for the determination of ammonia and acidity in meat, and of sugars in cereal products, correction of Munson and Walker's sugar table, new methods for vinegar analysis (including glycerol determination), schemes for the separation of food colors, a subchapter on formic acid (recently introduced as a preservative), methods for the analysis of lemon and orange oils, a summary of analyses of authentic samples of vanilla extract, and a complete revision of the final chapter on fruit and vegetable products with new sections on tomato catsup, dried fruits, preserves (including maraschino cherries), fruit juices, and nonalcoholic carbonated beverages. In the final chapter are included descriptions of recent methods for the determination of tin, vegetable acids, and habit-forming drugs, and for the detection of saponin, also microscopical methods for the detection of spoilage. The text of the federal pure food law, as amended during the present year, and of the meat inspection law are added for ready reference as an appendix."

The detection of phytosterol in mixtures of animal and vegetable fats, R. H. KERR (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 212, pp. 4*).—Inasmuch as the fat rendered from carcasses of animals fed on cotton-seed products give the Becchi and Halphen reactions for cotton-seed oil, provided the fat has not been heated to a very high temperature, the only certain method with a fat suspected of being adulterated with a vegetable oil is to test it for the presence of phytosterol, which does not appear in the fat of an animal fed on cotton-seed products.

The principal objection to the usual method for phytosterol is the long time required to carry it out. "As a result of efforts to shorten the method, certain modifications of the details have been introduced, which resulted in the saving of considerable time, and also in avoiding troublesome steps in the process. The principal changes and advantages secured are (1) the employment of a larger sample, which gives a correspondingly larger amount of unsaponifiable material; (2) the extraction of the sample with alcohol, by which means the handling of large amounts of soap is avoided; (3) the method of extracting the soap with ether, which avoids emulsions and allows the extraction to be accomplished in a few minutes; and (4) the treatment of the acetates, by means of which it is possible to obtain pure crystals from the second crystallization."

For the saponification and extraction with ether, the method used by Sal-kowski^a for the isolation of cholesterol is used. For preparing the acetates "a small amount (3 to 5 cc.) of acetic anhydrid is added to the dry residue in the beaker and heated to boiling over a free flame, the beaker being covered with a watch glass during the process. After a brief boiling—a few seconds is sufficient—the flame is removed and the beaker transferred to the steam bath and left there until the acetic anhydrid is driven off."

^a Hoppe-Seylers Ztschr. Physiol. Chem., 57 (1908), No. 5-6, pp. 515-528.

The purification of the acetates is based on a method devised by H. Matthes and W. Heintz^a, which consists of treating the acetates with 80 per cent alcohol. The melting point of the acetates is finally determined. Cholesterol acetate has a lower melting point than phytosterol acetate.

The detection of shells in cacao and its preparations, C. ULRICH (*Arch. Pharm.*, 249 (1911), No. 7, pp. 524-597; *abs. in Chem. Abs.*, 6 (1912), No. 13, p. 1816).—The methods now in use for determining the cacao shells in cacao preparations can only be employed where 30 per cent or more of shells are present. The author suggests a method which consists of extracting the preparation with a 50 per cent solution of acetic acid and precipitating with ferric chlorid. This will show the presence of 10 per cent or more of shells devoid of coloring matter.

Examination of the precipitate produced by basic lead acetate in wine.—Pentose and methyl pentose determination in grapes and wines, T. VON FELLEBERG (*Mitt. Lebensm. Untersuch. u. Hyg. Schweiz. Gesundheitsamt.*, 3 (1912), No. 5, pp. 213-227, figs. 2).—If a wine is neutralized with calcium carbonate and treated with lead acetate, filtered, and the filtrate treated with basic lead acetate, or better, with basic lead nitrate, a precipitate is obtained which consists of succinic acid, probably some sulphurous acid, inosit, pectin, pentosan, methyl pentosan, and in red wines a trace of coloring matter. By determining the precipitate by the method described, artificial or dry berry wines give abnormally low results.

Grapes contain pentoses and methyl pentoses in a free state which are in part precipitable by basic lead nitrate. These are probably present as pentosans and methyl pentosans. Grape juice contains a large percentage of methyl pentose while the dregs, hulls, seeds, and stems have a higher pentose content. The dry wines of commerce contain very little pentose and methyl pentose. Wines made from these dregs are characterized by having a different ratio of sugars, i. e., pentose and methyl pentose, than the natural wines.

The biological detection of poisonous castor bean constituents in feeding stuffs, KRANICH (*Ztschr. Veterinärk.*, 24 (1912), No. 10, pp. 455-464; *abs. in Berlin. Tierärztl. Wchnschr.*, 28 (1912), No. 48, p. 894).—Meissner's and Mooser's findings (*E. S. R.*, 22, pl. 81; 25, p. 683; 26, p. 209) in regard to this subject are discussed but it is deemed necessary to have a much simpler method for this purpose. The method which is recommended is as follows:

Two gm. of the feeding stuff is mixed with 40 cc. of glycerin, placed for 10 minutes in a water bath at 50° C., and shaken several times during the interval. The mixture is expressed in a Mull filter 4 times, and the turbid fluid which is obtained (about 35 cc.), is mixed with 350 cc. of a mixture consisting of equal parts of alcohol and ether. The mixture is allowed to stand for one-quarter of an hour to allow the precipitate to settle; the supernatant fluid then poured off, the precipitate collected on a small folded filter, and washed with alcohol and then with ether. The residue is allowed to dry in the air, which takes about 15 minutes, and with the filter is then brought into a Petri dish, 10 cc. of a 10 per cent sodium chlorid solution having a temperature of 50° C. poured over it, and the mixture filtered through an asbestos filter. One cc. of the clear filtrate obtained is placed in an Uhlenhut test glass and a layer of 0.1 cc. antiserum added in the usual manner. A reaction is obtained in from 10 to 20 minutes.

Detection of particles of castor seeds in feeding stuffs, K. BIERBAUM (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 12 (1912), No. 4, pp. 351-371).—For the detection of nonpoisonous castor beans in feeding stuffs the comple-

^aArch. Pharm., 247 (1909), No. 3, pp. 161-175.

ment fixation method with a specific antiserum is considered the best procedure, as markedly specific quantitative results can be obtained with samples which contain only a small amount of the seeds. Miessner's method (E. S. R., 25, p. 683), and the Miessner and Rehwald conglutination procedure are not deemed reliable.

Milk testing, C. W. WALKER-TISDALE (*London, 1911, 2. ed., pp. 84, figs. 28*).—This practical handbook was gotten up for the milk producer, dairy farmer, creamery manager, and estate agent. It deals chiefly with European methods for examining milk, e. g., Gerber's test for fat, etc.

A rapid and exact method for counting leucocytes and bacteria in milk, O. SKAR (*Milchw. Zentbl., 41 (1912), Nos. 15, pp. 454-461, figs. 2; 23, pp. 705-712*).—The method consists of counting the stained organisms on a special slide with the aid of an ocular micrometer. It could be used for milk showing acidity which corresponds to 14 Soxhlet-Henkel degrees, and also for colostrum and mastitis milks.

In this method 0.4 cc. of a 2 per cent carbol-methylene blue solution is placed in a test tube, and 10 cc. of milk from a pipette is added; the mixture is shaken thoroughly and warmed in a water bath (highest temperature 70° C.) for from 5 to 10 minutes. With a capillary pipette 1/50 cc. of colored milk is withdrawn and spread on the slide with the aid of a very fine platinum needle up to the limit of a square (20 by 24 mm.) drawn on the glass. The preparation is allowed to dry in the air, and is not fixed, nor is the fat removed. Then a drop of emersion oil is brought directly on the preparation and examined with a 1/12 lens, using the No. 1 eyepiece. Canada balsam and a cover glass can be used, but they are deemed of doubtful value.

The ocular micrometer consists of a glass plate on which certain lines are scratched or etched. In the center is a small square which is of such a size that when the lens is focused upon the object, it will cover 1/400 sq. mm., and also a square which represents 5/400 sq. mm. of the object surface. Both of the squares are surrounded by 2 circles, the inner one of which represents a surface of 10/400 sq. mm., and the outer 12.5/400. Finally the entire field is intersected by 2 lines which divide the field into 4 parts. The bacteria, etc., present in from 10 to 20 fields are counted in the operation. A table for simplifying the calculation is given.

When bacteria alone are to be counted, the milk can be pretreated with sodium hydroxid (30 per cent); this makes the bacteria very distinct. The errors encountered in making bacterial counts on gelatin plates are discussed.

About Cornalba's figures in milk examinations, F. LEPPERRE (*Abs. in Chem. Ztg., 36 (1912), No. 25, p. 222*).—New investigations have shown that Cornalba's figures are only constant when milks from the same cow are examined. Great differences were observed with various cows from different localities.

Variations in the total solid and ash content of milk from cows affected with streptococcic mastitis, CHRÉTIEN (*Hyg. Viande et Lait, 6 (1912), No. 7, pp. 382, 383; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 49, p. 924*).—The total solids and ash content of milk coming from cows affected with mastitis increase at the beginning of the disease but diminish as it goes on until the mammary gland becomes sclerotic. The total solids varied between 10.29 and 22.89 per cent, and the ash between 0.34 and 1.025 per cent. See also a previous note by Fetzer (E. S. R., 27, p. 878).

About international methods for judging milk, C. BARTHEL and O. JENSEN (*Milchw. Zentbl., 41 (1912), No. 14, pp. 417-429; K. Landtbr. Akad. Handl. och Tidskr., 51 (1912), No. 7-8, pp. 596-610*).—It is stated that the reductase test will probably become recognized as an international test for determining the quality of milk. It is, however, necessary to use uniform methylene blue preparation free

from zinc, and to operate with uniform amounts of reagents and milk and at the same temperature. The tests here reported were conducted at from 38 to 39° C., and the reagent was used in the form of tablets. The strength of the methylene blue reagent may be determined by titrating it with ammonium sulphid in an acid solution.

In the investigation reported 219 samples of Swedish and Danish milks were examined with the reductase and fermentation tests. Bacterial counts were made parallel with the tests. For the counts a medium consisting of the following was used: Water, 1,000 gm.; gelatin (gold), 120 gm.; peptone (Witte), 20 gm.; lactose, 10 gm.; dextrin, 10 gm.; sodium chlorid, 2 gm.; dicalcium phosphate, 2 gm.; and magnesium sulphate, 1 gm. The gelatin was neutralized with phosphoric acid until only a slight blue color was noted with litmus paper. Agar plates were less valuable for determining the bacterial content.

The results obtained make it apparent that a very poor milk is one which does not retain the blue color longer than 20 minutes and contains, as a rule, over 20 millions of bacteria per cubic centimeter. Such milk is to be placed into the fourth class. Poor milk, which retains the blue color longer than 20 minutes but not more than 2 hours, usually has a bacterial content varying between 4 and 20 millions per cubic centimeter, and is put into the third class. A milk of medium quality (second class) is one which will not discharge the blue color within 2 hours but does in less than 5½ hours and contains, as a rule, from ½ to 4 millions of organisms per cubic centimeter. A good milk (first class) will not discharge the color within 5½ hours and contains about ½ million of bacteria per cubic centimeter. The above criteria also holds good for cream.

It was found that there were certain exceptions to the above rule in 23 per cent of the cases with milk and in 18 per cent with cream. Despite these facts the reductase test is considered a good one. The fermentation test can be used in conjunction with it for milks which come in the second and third classes.

The organoleptic, leucocyte (Trommsdorff), dirt test, and direct bacterial count with the microscope are also discussed.

Hygienic investigation of market milk, G. L. J. GOOREN (*Centbl. Bakt. [etc.]*, 2. Abt., 35 (1912), No. 25, pp. 625-646).—The production of first-class milk as carried on in Holland is considered a distinct advance in milk production, whereas the production of so-called "reform milks" is regarded as hardly an indication of progress, since it does not come directly from the producer.

Special or pattern milk (muster milch), should not contain more than 25,000 micro-organisms per cubic centimeter. The determination of the freezing point is a good aid for noting milks having a normal composition, because a normal milk, as a rule, has a freezing point not higher than -0.54. The test, however, can not be entirely relied upon, because as Koning has shown, some normal milks possess freezing points as low as -0.515. The removal of cream usually lowers the freezing point, but only when as much as one-half is removed.

Homogenizing and sterilizing lower the freezing point of milk, and do so considerably where both are combined. Heating the milk at temperatures lower than the pasteurizing temperature also lowers the freezing point.

Leather investigations: The composition of some sole leathers, F. P. VEITCH and J. S. ROGERS (*U. S. Dept. Agr., Bur. Chem. Bul.* 165, pp. 20).—This bulletin shows that the weighting of leather with useless or harmful materials is extensively practiced in this country. The leathers examined were in part sent by representative tanning companies, shoemakers, and sole cutters, and some were purchased in the open market from dealers.

"A large majority of the samples examined contained an unnecessary quantity of uncombined tanning material. But little less than \$1,000,000 worth of tannin is wasted annually in this way. Sixty-three per cent of the leathers examined were weighted with glucose, with Epsom salts, or with both. The quantity of loading varied from 1 to 7.3 per cent of Epsom salts, with an average of 3 per cent. The maximum quantity of glucose in the loaded leathers was 10.4 per cent and the average 5.5 per cent. The maximum amount of these loading materials found in any leather was 16 per cent and the average where both were present was 8 per cent. The results obtained indicate that not less than 12,000,000 lbs. of glucose and Epsom salts are sold annually in sole leather to the American people.

"The materials add absolutely nothing to the wearing value of the leather, and where present in large quantities, may positively decrease its wear. Shoes made from these leathers are readily penetrated by water. Loading makes leather more costly, consequently an inferior leather costs more than a good leather. Leather-making raw materials are wastefully consumed, the product may be inferior; the cost increased, and health is endangered by the prevalent practices of weighting and bleaching sole leather."

Sisal, W. McGEORGE (*Hawaii Sta. Rpt.* 1912, pp. 58, 59).—The results of this work have been previously noted (E. S. R., 27, p. 717).

Methods of manufacture and their influence on the maple product, A. H. BRYAN (*Proc. Vt. Maple Sugar Makers' Assoc.*, 1911, pp. 22-29).—This is a discussion of the methods of manufacturing maple sirup and sugar used in Vermont, etc., and deals particularly with the factors involved in obtaining a light-colored, fine-flavored maple sirup. This is said to depend almost wholly upon handling the fresh sap under cleanly conditions and boiling to a sirup as quickly as possible.

Cider sickness, B. T. P. BARKER and V. F. HILLIER (*Rpt. Brit. Assoc. Adv. Sci.*, 1911, pp. 596, 597; *Jour. Ag. Sci.*, 5 (1912), No. 1, pp. 67-85).—Cider sickness is a disease of cider and perry which occurs in the early part of summer. The first symptoms usually noted are the characteristic frothing of the liquor and a sudden and violent evolution of carbon dioxid gas mixed with a little hydrogen gas. With this process the pleasant, fruity character of the cider disappears and is displaced by a disagreeable peculiar odor and taste, and it later becomes turbid, loses its color, and becomes milky and thick. In some instances the cider remains clear but deposits a thick precipitate.

During the "sickness" the specific gravity decreases owing to the destruction of sugar, and the percentage of alcohol is increased. Such cider is prone to acetification. Tannin present in large amounts does not check the disease.

"An examination of the flora of sick ciders has led to the isolation of a bacterium which can produce all the symptoms of sickness in sterilized ciders and perry infected with pure cultures of it. The characters of the organism have been studied in detail. It is motile and facultatively anaerobic. Its optimum temperature of growth is about 30° C. No growth has been observed above 40°, and at temperatures below 12 to 15° growth is extremely slow. It can ferment dextrose and levulose, producing alcohol and an evolution of gas which consists of about 95 per cent carbon dioxid and 5 per cent hydrogen. A characteristic acid odor resembling that of decaying lemons is also formed in dextrose solutions. The acidity of the solution is somewhat increased, but the presence of any of the commoner organic acids has not been recognized. Neither saccharose, maltose, nor lactose appear to be attacked by it. It grows best in neutral or very slightly acid media. Solutions containing more than 0.5 per cent malic acid are unfavorable to its development. It can ferment beer wort but the

characteristic aroma and flavor of sickness are not produced. Growth is slight on all the solid media tested. Gelatin is not liquefied by it.

"The most promising measures for combating the disorder are sterilization of all vessels and appliances which have been contaminated with sick cider, storage at a low temperature, and suitable blending of ciders to raise the acidity above 0.5 per cent malic acid and to give a moderately rapid normal rate of fermentation. It has also been observed that ciders liable to the disorder will escape if bottled very early in the season, whereas if bottled at the usual period they quickly turn sick."

The bacteria in wines and fruit wines and the changes produced by them, MÜLLER-THURGAU and A. OSTERWALDER (*Centbl. Bakt. [etc.], 2. Abt., 36 (1912), No. 6-14, pp. 129-338, pls. 3*).—This is a biochemical study of the changes produced in wines by the organisms usually present under abnormal conditions. The various strains of micro-organisms were studied on different substrats, i. e., carbohydrates, glucosids, etc., and in the wine itself.

The yearly reports of the society of alcohol manufacturers of Germany (*Jahrb. Ver. Spiritus Fabrik. Deut., 11 (1911), pp. XV+582; 12 (1912), pp. XVI+626*).—These reports deal with the progress made during 1911 and 1912 in alcohol and starch manufacture and potato drying.

METEOROLOGY—WATER.

Report of the Chief of the Weather Bureau, 1912 (*U. S. Dept. Agr., Weather Bur. Rpt. 1912, pp. 272, pls. 4*).—This contains an administrative report on work during the fiscal year ended June 30, 1912, and includes accounts of investigations at Mount Weather research observatory, forecasts and warnings, and river and flood, marine, and climatological observations, and tables giving a general summary of the weather conditions in the United States by months during the year 1911, annual summary of climatological data at the Canadian stations for 1911, a list of observing stations and changes therein during 1911, sunshine in 1911, details of excessive precipitation in 1911, monthly and annual meteorological summaries in 1911, monthly and annual amounts of precipitation in 1911, and monthly and seasonal snowfall in 1911-12.

Climatic measurements, E. G. SCHOLLANDER (*North Dakota Sta., Rpt. Williston Substa., 1910, pp. 66, 67*).—Observations on the temperature of the air and the soil, precipitation, evaporation, velocity of the wind, etc., at Williston during 1910 are reported.

Climatic measurements, E. G. SCHOLLANDER and W. WHITCOMB (*North Dakota Sta., Rpt. Williston Substa., 1911, pp. 60, 61*).—This is a record of observations at the Williston substation during 1911 on temperature and precipitation.

The fertilizing value of rain and snow, F. T. SHUTT (*Canada Expt. Farms Rpts. 1912, pp. 164-166*).—The results of previous observations (*E. S. R., 27, p. 317*), showing that 70 per cent of the nitrogen in the rain was free and organic ammonia and 30 per cent was in the form of nitrates and nitrites, were confirmed. The relative proportions of these forms of nitrogen in snow were 64 and 36 per cent, respectively.

Geology and underground waters of the Wichita region, north-central Texas, C. H. GORDON (*U. S. Geol. Survey, Water-Supply Paper 317, pp. 88, pls. 2*).—The region considered in this report "comprises Montague, Clay, Wichita, Wilbarger, Hardeman, Foard, Knox, Baylor, Archer, Jack, Young, Throckmorton, and Haskell counties. Its area is approximately 11,139 square miles." The report "presents the results of an investigation made to determine

the geologic conditions with a view to locating water-bearing formations that might be available sources of water and includes a brief description of the geology and water resources of each county and a geologic sketch map of the area." Analyses of many of the waters are also reported.

The surface water supplies are fluctuating and uncertain. The investigations showed "the occurrence of abundant supplies of underground water in this region, but almost invariably the water was found to be highly charged with mineral matter. . . . Over a large part of this region the surface waters constitute the chief source of supply, both for domestic use and for stock. Away from the main valleys the rainfall is stored in surface tanks for use during the dry part of the year. Owing to the generally friable character of the rocks, the surface waters are charged with fine reddish silt which settles very slowly." Great care in the protection of the waters against pollution and removal of the silt is urged.

Surface water supply of Seward Peninsula, Alaska, F. F. HENSHAW, G. L. PARKER, ET AL. (*U. S. Geol. Survey, Water-Supply Paper 314, pp. 317, pls. 17, figs. 12*).—The results of stream flow measurements made in Seward Peninsula during the years 1906 to 1910, inclusive, are reported, with a sketch of the geography and geology of the peninsula by Philip S. Smith and a description of methods of placer mining by Alfred H. Brooks.

The water supply of farm homesteads, F. T. SHUTT (*Canada Expt. Farms Rpts. 1912, pp. 167-171*).—In continuation of previous studies on this subject (*E. S. R.*, 27, p. 317), 90 samples of farm water supplies were examined. Of these 22 were found to be pure and wholesome, 26 highly suspicious, 24 seriously contaminated, and 18 saline.

The purification of public water supplies, G. A. JOHNSON (*U. S. Geol. Survey, Water-Supply Paper 315, pp. 84, pls. 8, fig. 1*).—"This paper gives a simple and direct statement of the principles governing the purification of water used for domestic purposes and seeks to indicate how best to deal with the various problems involved. It includes a brief account of the sources of water supply, the development of waterworks, water consumption, and the reduction of typhoid fever in the United States. Methods of filtration, sterilization, and softening of municipal waters are discussed in full. Halftone plates and zinc etchings show filtration plants in several cities."

SOILS—FERTILIZERS.

Soils, W. McGEORGE (*Hawaii Sta. Rpt. 1912, pp. 51-56*).—Results of examinations of soils proposed for pineapple culture, especially with reference to their content of manganese, are briefly reported. The largest amount of manganese found in any of these soils was 1.13 per cent, a much smaller amount than occurs in soils previously examined. Some of the soils, however, contained high percentages of titanium, as much as 34 per cent of titanium oxid in one case. "The normal Hawaiian soils contain about 5 per cent of titanium oxid." These titanium soils contain a very small amount of aluminum and a large amount of ferrous iron.

A series of lysimeter experiments to determine the chemical and physical effect of lime on certain soils which were not visibly improved in their tilth by application of lime is reported, indicating no very striking chemical effects from the use of the lime either in form of carbonate or of sulphate, although addition of the sulphate increased the solubility of the manganese and magnesium. The results were not conclusive as to the effect of the lime on nitrates and ammonia. Capillary rise of water was more rapid where no lime had been added to the soil.

Soil tank investigations, S. E. COLLISON (*Florida Sta. Rpt. 1912, pp. XLIII–XLVII*).—Studies of the chemical composition of the drainage water from soil tanks used in fertilizer investigations with oranges were continued (E. S. R., 27, p. 320) and the losses of fertilizing constituents indicated by the analyses are discussed. The tanks received 2 lbs. three times a year of a fertilizer mixture containing 5 per cent of ammonia in various forms, 6 per cent of phosphoric acid in form of superphosphate, and 6 per cent of potash in form of sulphate.

Of the total rainfall (44.58 in.) 36.7 per cent appeared in the drainage. The nitrogen in the drainage water was almost entirely in the form of nitrate and the amount was greater where sodium nitrate was applied than where ammonium sulphate was used. In some cases the loss was greater with dried blood than with ammonium sulphate. The loss of potash in the drainage has shown a slow increase from the beginning but is still very small. The loss of phosphoric acid was found to be extremely small, but was slightly increased by the application of superphosphate. Lime and magnesia appeared in the drainage water in fairly large amounts.

Tank experiment for 1910, E. G. SCHOLLANDER (*North Dakota Sta., Rpt. Williston Substa., 1910, pp. 53–66, fig. 1*).—A continuation of experiments carried on in cooperation with this Office at the Williston substation is reported. It was found that evaporation was greatest from the uncultivated tanks, but that tanks cultivated 6 in. deep lost more water by evaporation than those cultivated 2 and 4 in. deep. The uncultivated tanks were several degrees warmer than the cultivated tanks. The lowest average temperature was observed in tanks cultivated 2 in. deep. The growing of a crop of corn increased the loss of moisture from the soil, notwithstanding the fact that the soil was cultivated to conserve moisture. There was more moisture in the upper 3 ft. of straw mulched soil than in cultivated soil. There was practically no difference in the fourth foot of soil, and in the fifth and sixth foot there was more moisture in the cultivated soil than in the mulched soil. Plowing and harrowing increased the moisture content of the surface soil.

Moisture conservation by tillage and cropping, E. G. SCHOLLANDER and W. WHITCOMB (*North Dakota Sta., Rpt. Williston Substa., 1911, pp. 54–60*).—A progress report is given on the effect of fall and spring plowing, continuous cropping and alternation with fallow, and disking stubble after harvest on the moisture content of the soil.

Nitrogen enrichment of soils, F. T. SHUTT (*Canada Expt. Farms Rpts. 1912, pp. 144–146, pl. 1*).—This is a report of a continuation of observations on the increase of nitrogen in the soil as a result of the growth of clover (E. S. R., 27, p. 322), summarizing data obtained during 10 years. It is shown that the nitrogen content of the soil has been increased during this period 511 lbs. per acre to a depth of 4 in.

The intensity of nitrification in arid soils, R. STEWART (*Proc. Amer. Soc. Agron., 4 (1912), pp. 132–149*).—The investigations here reported have already been noted from another source (E. S. R., 29, p. 21).

The fixation of nitrogen by so-called zeolites, G. WIEGNER (*Jour. Landw., 61 (1913), No. 1, pp. 11–56, pls. 2, fig. 1*).—The experiments reported showed that the addition of small amounts of calcium-potassium permutite, which had been saturated in a solution of ammonium chlorid, increased the yield of dry matter of oats as well as of the following crop of buckwheat but had little effect upon the total amount of nitrogen assimilated in either case. There was, however, a marked increase in the nitrogen assimilated by the grain as compared with other parts of the plant, and an increase in dry matter was also most marked in case of the grain. This effect was apparently due to the fact

that the nitrogen of the zeolite acted more slowly than that of more readily soluble nitrogenous fertilizers which tend to increase the growth of straw at the expense of grain.

On the relation of plants to soils, I. CANAVARI (*Staz. Sper. Agr. Ital.*, 45 (1912), No. 10, pp. 725-752, figs. 4).—This article deals with studies of the composition of the parent rocks, bacteriological condition, soil solution and temperature, and natural and cultivated plant growth of certain soils occurring near the agricultural institute of Perugia.

The plant as an indicator of the relative density of soil solutions, T. L. LYON and J. A. BIZZELL (*Proc. Amer. Soc. Agron.*, 4 (1912), pp. 35-49, fig. 1).—Series of water, sand, and soil cultures with wheat are reported.

"In the water cultures used in these experiments for growing wheat seedlings the dry matter produced per unit of transpiration increased with the density of the solution except in the case of very dilute solutions.

"Wheat seedlings growing in crushed quartz containing the same nutrient solutions as those used in the water cultures produced the same relative quantities of dry matter per unit of transpiration as did the water cultures.

"The quantitative production of dry matter per unit of transpiration was, in each case, greater in the quartz than in the water culture of corresponding strength. This may possibly be accounted for by the absorptive properties of the quartz particles.

"In a series of wire basket tests, in which rock superphosphate, muriate of potash, and nitrate of soda were added to the soil in different baskets singly and in various combinations, the crops grown in the fertilizer-treated baskets produced in every case a greater quantity of dry matter per unit of transpiration than did the unfertilized soil, and up to a certain point an increase in the quantities of fertilizers used produced the same result.

"Taking the relation of dry matter to transpiration as an indication of the density of the media from which the plant absorbs its mineral nutriment, the addition of fertilizers to the soil used in the experiment increased in every case the density of the solution with which the absorbing root surfaces came in contact, and in most cases the density of the soil solution was augmented by an increase in the quantity of fertilizers applied.

"A comparison of the method described with the electrical resistance method shows that they agree in indicating a greater density of the nutrient solution in the soil to which fertilizers, single and combined, are added, but that in certain cases, notably when acid phosphate is applied, they are not in entire agreement.

"The density of the soil solutions, as measured by the Wheatstone bridge, is probably not the same as the effective density of the solution from which the plant draws its nutriment."

The action of frost on soils, P. EHRENBURG and G. VON ROMBERG (*Jour. Landw.*, 61 (1913), No. 1, pp. 73-86).—The general conclusion from the investigations here reported is that in soils the colloids of which are but slightly affected by frost the latter causes a finer division of the soil particles and thus increases the hygroscopicity of the soil, an increase of from 2 to 8 per cent being observed. On the other hand, in soils the colloids of which are appreciably affected by frost there may be a reduction of hygroscopicity of as much as 4 per cent.

Sunlight, W. McGEORGE (*Hawaii Sta. Rpt.* 1912, pp. 59-62, fig. 1).—Observations were made in cooperation with the Philippine Bureau of Science on the actinic power of the sun, using for this purpose a solution of oxalic acid in the presence of uranium acetate. It was found that the actinic effect of the sun was highest at the spring and fall equinoxes and lowest at the summer and winter solstices.

Maintenance of soil fertility: Plans and summary tables (*Ohio Sta. Circ. 131*, pp. 17-40, figs. 6).—This is one of the annual statements on the subject (E. S. R., 27, p. 124), bringing the data for the experiments up to the end of 1912 and summarizing the results for 19 years (1894-1912).

The relation of fertilizers to soil fertility, F. B. GUTHRIE (*Agr. Gaz. N. S. Wales*, 24 (1913), No. 3, pp. 217-233).—The present state of knowledge on this subject is reviewed, the general conclusion being "that the action of fertilizers is not confined to supplying the crop with food, but that it is far more complex, and that fertilizers influence the physical structure of the soil, and also its biological and chemical condition in a great variety of ways; further, that we have to take into account a large number of factors which affect the fertility of the soil and which are quite independent of its supply of plant food."

The importance of the place in the rotation at which fertilizers are applied, G. F. WARREN (*Proc. Amer. Soc. Agron.*, 4 (1912), pp. 58-62).—This article emphasizes the importance of studying the requirements of the plant, as well as the soil, in fertilizer experiments.

Some business questions involved in the interpretation of fertilizer tests, G. F. WARREN (*Proc. Amer. Soc. Agron.*, 4 (1912), pp. 62-66).—In this article the importance of considering the most profitable, as contrasted with the maximum, increase of yield which can be produced by the use of fertilizers is emphasized.

Practical suggestions about the purchase of commercial fertilizers, J. H. VOORHEES (*Tribune Farmer* [N. Y.], 12 (1913), No. 593, pp. 1, 2).—The purchase of unmixed materials containing in cheapest form the fertilizing constituents which practical experience has shown to be actually needed is advised, the materials to be either applied separately or mixed on the farm as required.

Statistical yearbook of fertilizers and chemical products used in agriculture, E. and M. LAMBERT (*Annuaire Statistique des Engrais et Produits Chimiques Destinés à l'Agriculture*. Paris, 1912, pp. 328; rev. in *Jour. Agr. Prat.*, n. ser., 24 (1912), Nos. 46, pp. 619, 620; 47, pp. 660, 661; *Bul. Soc. Nat. Agr. France*, 72 (1912), No. 8, pp. 765-774; *Rev. Gén. Sci.*, 23 (1912), No. 18, pp. 707-709; *Econ. Franç.*, 40 (1912), II, No. 50, pp. 864-866; *Génie Civil*, 62 (1913), No. 10, pp. 192, 193, 200).—This yearbook gives very complete statistics up to the end of 1911 of the world's production and consumption for agricultural purposes of sodium nitrate, calcium nitrate, calcium cyanamid, ammonium sulphate, Peruvian guano, potash salts, phosphates, superphosphates, and Thomas slag, and of pyrites and sulphuric acid used in the manufacture of fertilizers.

Importance of the South in the production and consumption of fertilizers (*Manfrs. Rec.*, 63 (1913), No. 12, pt. 2, p. 32; *Amer. Fert.*, 38 (1913), No. 8, pp. 34-36).—This article reports and discusses statistics which show that the consumption of fertilizers in 12 southern States increased from 1,683,964 tons in 1901 to 3,954,468 tons in 1912. In the 10 years 1900 to 1910 the expenditures for fertilizers in 17 southern States increased from \$29,277,000 to \$75,391,000, while the total expenditures for this purpose in the whole United States increased from \$53,630,000 to \$114,273,000. Among the larger increases were 193 per cent in Alabama, 245 per cent in Arkansas, 378 per cent in Florida, 193 per cent in Georgia, 190 per cent in Mississippi, 173 per cent in North Carolina, 237 per cent in South Carolina, and 371 per cent in Texas.

Tests with four nitrogenous manures (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 13 (1913), No. 2, pp. 294-299).—Comparative tests were made of sodium nitrate, ammonium sulphate, calcium nitrate, and calcium cyanamid in field experiments with oats, potatoes, turnips, and mangels.

The results tend to show that when properly used on suitable soils the four fertilizers are practically of equal value per unit of nitrogen. The use of the calcium nitrate and calcium cyanamid, however, is not advised unless they can be purchased at a substantially lower price per unit of nitrogen.

The calcium nitrate and cyanamid are described and their relative commercial value as compared with sodium nitrate and ammonium sulphate is discussed.

Calcium nitrate, F. W. DAFERT and R. MIKLAUZ (*Ztschr. Landw. Versuchswo. Österr.*, 16 (1913), No. 2, pp. 44-46).—In experiments in the mixing of Norwegian calcium nitrate with superphosphate it was found that when ordinary commercial superphosphate containing free phosphoric and sulphuric acids was mixed with commercial calcium nitrate containing some nitrite there was considerable loss of nitrogen. With chemically pure products there was practically no loss of nitrogen.

Norwegian nitrate, C. VON SEELHORST and SIMMERMACHER (*Jour. Landw.*, 60 (1912), No. 4, pp. 367, 368; *abs. in Ztschr. Angew. Chem.*, 26 (1913), No. 24, *Referatenteil*, p. 195; *Chem. Abs.*, 7 (1913), No. 8, p. 1399).—Treatment with oil did not diminish hygroscopicity or reduce the tendency of the nitrate to leach out of the soil.

Burkheiser salt, a nitrogenous fertilizer, A. WIELER (*Deut. Landw. Presse*, 39 (1912), No. 74, pp. 847, 848; *abs. in Ztschr. Angew. Chem.*, 26 (1913), No. 24, *Referatenteil*, p. 195).—This salt is a by-product of gas making, the hydrogen sulphid formed during the process of gas making being converted into sulphurous acid and made to combine with the ammonia present. The product is a white, slightly alkaline salt containing a mixture of 2 parts of ammonium sulphate and 1 part of ammonium sulphite. The salt has been recommended for direct use as a fertilizer, but a question has been raised as to the possible injurious effect of the sulphite. A few pot and field experiments have been made, which showed no injury from this source, and indicate that the salt is as effective as a fertilizer as pure ammonium sulphate.

The use of phosphates in Victorian agriculture, J. W. PATERSON and P. R. SCOTT (*Jour. Dept. Agr. Victoria*, 11 (1913), Nos. 3, pp. 160-165, *figs. 2; 4*, pp. 225-230, *figs. 3*).—The general deficiency in amount and availability of phosphoric acid in Victorian soils is pointed out. Dissolved phosphate is considered best suited to supply this need. Moderate liming, especially on grazing lands, is indicated as advisable by the experiments reported.

The occurrence of potassium salts in the salines of the United States, J. W. TURRENTINE ET AL. (*U. S. Dept. Agr., Bur. Soils Bul.* 94, pp. 96, *figs. 3*).—This is a detailed report on one phase of the investigation of the fertilizer resources of the United States recently authorized by Congress. Previous accounts giving the principal results recorded in this report have been already noted (*E. S. R.*, 28, p. 725). The results recorded show that potassium is practically always present in the natural salines of the United States, and sometimes in appreciable quantities, but "in no instance has an artificial or a natural (subterranean) brine been found to contain potassium in such amounts as to warrant its extraction commercially.

"The concentrates, while containing more potassium than the brines from which they were derived, do not contain sufficient of that substance to warrant attempts at its extraction.

"The bitterns derived from the manufacture of salt from sea water contain potassium in such amounts as to make it appear that they could be evaporated to make the so-called 'manure salts' of a sufficiently great potassium content to be valuable commercially.

"The brine of one desiccated lake of southern California has been found to contain sufficient potassium to make it a possibly valuable commercial source of potash."

The theoretical possibilities in separating the potash from various types of brine are pointed out in this bulletin and a review is given of proposed commercial methods.

The extraction of potassium salts from silicate rocks, W. C. HANCOCK (*Chem. World*, 2 (1913), No. 4, pp. 118, 119).—This is a brief review of methods.

The importance of potash in feldspars for plants, E. BLANCK (*Jour. Landw.*, 61 (1913), No. 1, pp. 1-10).—The results of comparative tests in pot experiments of various silicates of potash here reported confirm the results of previous experiments (E. S. R., 27, p. 520) in showing that mica is a more available source of potash for plants than feldspar.

The action of ground phonolite in several years' fertilizer experiments, P. WAGNER (*Mitt. Deut. Landw. Gesell.*, 28 (1913), Nos. 8, pp. 136-139; 9, pp. 151-154; 10, pp. 161-164).—The results of cooperative field experiments with farmers in continuation of earlier pot experiments (E. S. R., 20, p. 1118) using ground phonolite in comparison with 40 per cent potash salt and potassium sulphate on a variety of crops showed, in agreement with those obtained by many other investigators, that phonolite did not compare in effectiveness with the potash salts and was not capable of supplying plants with needed potash unless used in amounts far exceeding those usually applied in practice.

Kainit as a means of combating weeds, D. DETTWEILER (*Illus. Landw. Ztg.*, 33 (1913), No. 11, pp. 88, 89; *abs. in Chem. Abs.*, 7 (1913), No. 8, p. 1399).—Applied in pulverized condition when the dew is on the plants or shortly after a rain, or in solution, kainit was found to be an effective means of combating weeds.

The use of lime on land, F. D. GARDNER (*Proc. Amer. Soc. Agron.*, 4 (1912), pp. 67-74).—A briefer account of experiments here reported has already been noted from another source (E. S. R., 28, p. 223).

Influence of sulphur on the growth of potatoes and beets, E. CHANCIN and A. DESRIOT (*Jour. Agr. Prat.*, n. ser., 23 (1912), No. 12, pp. 365-367).—Experiments, in continuation of those already noted (E. S. R., 25, p. 519) with these crops, in which sulphur was used at rates of from 200 to 400 kg. per hectare (178 to 356 lbs. per acre), are briefly reported. The results indicate some increase in yield as a result of the application of the sulphur.

Recent experiments on the fertilizing action of sulphur, A. DESRIOT (*Jour. Agr. Prat.*, n. ser., 25 (1913), No. 12, pp. 364, 365).—This is an account of experiments in continuation of those noted above, sulphur being used in amounts varying from 50 to 200 kg. per hectare (44.5 to 178 lbs. per acre) on beets, potatoes, onions, and carrots. In case of the beets and potatoes the sulphur was used in connection with manure alone and manure and a complete fertilizer.

A green manure for tobacco, M. K. BAMBER (*Trop. Agr. and Mag. Ceylon Agr. Soc.*, 40 (1913), No. 2, p. 85).—This article deals particularly with the fertilizing value of the tulip tree (*Thespesia populnea*), which, it is stated, is now largely used as a green manure for tobacco by the Cingalese. Analyses are reported which show that sun-dried samples of this tree contained 2.2 per cent of nitrogen and 10.3 per cent of ash, the ash containing 26 per cent of lime, 26.8 per cent of potash, and 5.4 per cent of phosphoric acid. Analyses of other plants of value for green manuring are also reported, namely, *Vigna catjang*, *Crotalaria striata*, *Phaseolus lunatus*, *Leucaena glauca*, *Tephrosia purpurea*, and *T. candida*.

AGRICULTURAL BOTANY.

Syllabus of plant families, A. ENGLER and E. GILG (*Syllabus der Pflanzenfamilien*. Berlin, 1912, 7. enl. ed., pp. XXXII+387, figs. 457; noted in *Gard. Chron.*, 3. ser., 53 (1913), No. 1870, p. 200).—This contains a list of genera and species of plants arranged according to modern systems of classification. In addition to listing the more important species notes are given on their distribution, properties, uses, etc.

A list of plants growing without cultivation in Franklin, Hampshire, and Hampden counties, Massachusetts, G. E. STONE (*Amherst, Mass.*, 1913, pp. VII+72).—A list is given of 1,190 native and 303 naturalized and adventive species of pteridophytes and spermatophytes known to occur within the three counties which are included in the Connecticut Valley in Massachusetts.

A possible means of identifying the sex of + and — strains in the mucors, A. F. BLAKESLEE (*Abs. in Science*, n. ser., 37 (1913), No. 949, p. 385).—Certain of the hermaphroditic species of the mucors are said to be distinctly heterogamic, forming regularly large female gametes and smaller male gametes. By growing the + and — races of an isogamous dioecious species in contrast with such an heterogamic hermaphroditic species, a sexual reaction has been found to occur between female branches of the hermaphrodite and branches of the — race, on the one hand, and between male branches of the hermaphrodite and branches of the + race on the other hand. This reaction would lead one to consider the — race male and the + race female.

On the inheritance of certain characters in the common groundsel and its segregates, A. H. TROW (*Jour. Genetics*, 2 (1912), No. 3, pp. 239-276, pls. 4, figs. 4).—A study of the groundsel (*Senecio vulgaris*) has led the author to consider it an aggregate species which includes many elementary ones. Twelve of these elementary species have been cultivated and maintained pure and true to type for several generations. Six have been studied in detail and are distinguished by descriptive names. Five other forms have proved true to type in cultures, but have been less completely studied.

It has been found by experiment that the radiate character can be transferred by hybridization and subsequent segregation to nonradiate forms. Hairy varieties, in contrast to radiate ones, are not produced so readily.

The author in conclusion states that after an investigation extending over six years and including the critical examination of about 10,000 groundsel plants, he finds it difficult to estimate, even provisionally, the constitution of a casual wild plant. He believes that a study of the methods of genetics will lay a foundation upon which the evolutionist and taxonomist can build with safety.

Inheritance of flower size in crosses between species of Nicotiana, E. M. EAST (*Bot. Gaz.*, 55 (1913), No. 3, pp. 177-188, pls. 5).—A study is reported of crosses made between *N. forgetiana* and *N. alata grandiflora*.

Both these species are said to be almost always naturally self-fertilized and through numerous generations of self-fertilization to have become homozygous in their characters. These self-fertile species, which are perfectly fertile among themselves, gave self-sterile progeny. This fact did not affect the production of an F₂ generation, as the F₁ plants were perfectly fertile among themselves.

In *N. forgetiana* the mean corolla length was 25.6 mm. and *N. alata grandiflora* 78.8 mm., while the mean variability of the intermediate F₁ generation was 44.3 mm. This variation in the F₁ generation was very small, being about the same as that of the parental species. The F₂ generation, on the contrary, was very variable, and both grandparental types were reproduced. The length of style and of filament were perfectly correlated with the corolla length, and

the breadth of the corolla showed an average correlation with the length of the corolla equal to 61 per cent.

Abnormal root formation by potato, O. SCHLUMBERGER (*Ber. Deut. Bot. Gesell.*, 31 (1913), No. 1, pp. 60-63, figs. 2).—Following some observations by Vöchting (*E. S. R.*, 11, p. 710), the author succeeded in developing experimentally a root system at the basal end of a potato and in demonstrating corresponding thickenings in the vascular portion of the tuber.

Spontaneous detachment of twigs of some trees, M. DE VILMORIN and R. HICKEL (*Bul. Soc. Bot. France*, 59 (1912), No. 7, pp. 618-621).—The authors give an account of observations made on autumn twig cast as exhibited in various degrees by *Populus alba*, *P. nigra pyramidalis*, *P. canadensis*, *Quercus robur pedunculata*, *Q. rubra*, *Alnus* sp., *Cunninghamia sinensis*, and *Taxodium distichum*, becoming total in the last named. It is suggested that the long wet summer, abruptly succeeded by light frosts, may have been one of the determining influences.

Physiological and economic significance of the structure of the tracheids of conifers, I. W. BAILEY (*Abs. in Science*, n. ser., 37 (1913), No. 949, p. 384).—It is claimed that the so-called striated tracheids of conifers are a specialized type of tissue structurally organized to resist compression. Studies showed that cracking or splitting of tracheid walls in drying occurs sporadically and is confined to the so-called summer wood. Injection experiments showed that the membranes of bordered pits in freshly cut sapwood are perforated and are permeable to gases, colloids, and finely divided solids held in suspension.

Chondriosomes in living plant cells, A. MAXIMOW (*Anat. Anz.*, 43 (1913), No. 10-11, pp. 241-249, figs. 9).—The author claims to have obtained a clear and easy demonstration of chondriosomes in their various forms, stages, and relations (notably with starch and chloroplasts) by employing under high powers the hairs from cucurbit seedlings. Illustrations and descriptions are given. A brief bibliography is appended.

Anatomical and physiological studies on water conduction by dicotyledonous leaves with particular reference to palmately veined types, A. RIPPEL (*Ber. Deut. Bot. Gesell.*, 31 (1913), No. 1, pp. 48-52).—Continuing the work of E. Gerresheim with leaflets (*E. S. R.*, 28, p. 629) and employing like methods, the author carried out further anatomical and physiological investigations on water transpiration in dicotyledonous leaves, particularly in the palmately veined type, reaching the general conclusion that equalization of water and solute pressures may occur by means of the cross and distribution channels, both directly and through their walls, rendering any given portion of a leaf in a measure independent of the main channel morphologically proper thereto. It is thought, however, that, in case of such scarcity of water supply as may have been common in such years as 1911, these morphologically main channels may play an indispensable part in the life of a given portion of the leaf.

The resistance offered by leaves to transpirational water loss, B. E. LIVINGSTON (*Plant World*, 16 (1913), No. 1, pp. 1-35, figs. 3).—This amplifies a report previously noted (*E. S. R.*, 28, p. 528).

It is stated that the diurnal fluctuations in foliar transpiring power noted in some leaves are the resultants of very different fluctuations in case of the two leaf surfaces taken separately, as these may even be opposite in trend at a given time. It is asserted also that these fluctuations in the transpiring power in some cases are not fully accounted for by stomatal distribution and movements, but that incipient drying (*E. S. R.*, 27, p. 29) plays an important part. The indexes of foliar transpiring power show a wide range, rendering generalization difficult and uncertain at this time; but it is thought that further

study may give transpiring power a value as a systematic character, also that its reciprocal, resistance to water loss by transpiration, may prove to be of practical value in agricultural work.

Photochemical effects from the mercury vapor lamp contrasted with those from sunlight, A. J. KLUYVER (*Österr. Bot. Ztschr.*, 63 (1913), No. 2, pp. 49-51).—The author, calling attention to work done by himself (E. S. R., 27, p. 827) and others, maintains that it is inadmissible to assume that under sunlight certain photochemical processes go on just as observed under the light of the mercury vapor lamp, since practically all the shorter wave lengths are absorbed from the former by the air.

Light as a factor inducing plant succession, E. C. GATES (*Rpt. Mich. Acad. Sci.*, 13 (1911), pp. 201, 202, fig. 1; *abs. in Bot. Centbl.*, 122 (1913), No. 3, p. 71).—An account is given, with graphical quantitative representation, of the retreat of blue grass from the shaded area under a basswood tree, its advance toward the trunk on defoliation of the tree due to cold, and its retreat again on refoiliation in the summer, also of the behavior of chickweed and moss during these changes.

The mode of action of weak solutions of electrolytes on germination, H. MICHEELS (*Acad. Roy. Belg., Bul. Cl. Sci.*, 1912, No. 11, pp. 753-765; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 2, p. 198).—In order to test the hypothesis that differences in favorable or deleterious effects observed between anodic and cathodic solutions are due to differences set up in the acidity or alkalinity of the liquids, the author studied the comparative effects observed on adding small quantities of acids and bases, also those of electrolyzed solutions. The results are considered to confirm previous conclusions (E. S. R., 25, p. 25), showing further that the chief differences are primarily due to the liberation of ions, particularly the cations. It is also suggested that the retardation effects observed as to growth are caused by a colloidal precipitation in the root cells.

The limits of germination of seeds after being placed in salt solutions, P. LESAGE (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 7, pp. 559-562, fig. 1).—In continuation of investigations previously reported (E. S. R., 27, p. 330), the author has studied the limits of germination of seed when placed for different lengths of time in varying solutions of the nitrates, sulphates, and chlorids of sodium, potassium, and ammonium. The results are shown in a series of curves, the ordinates and abscissas of which represent the time and strength of solutions.

Effects of using salt solutions for watering and sprinkling plants, J. KUIJPER (*Dept. Landb. Suriname Bul.* 28, 1912, pp. 25-31).—In several series of experiments employing salt solutions varying from 0.025 to 4 per cent on coffee, cacao, and other plants, it was found that the injurious effects appeared at a point ranging from about 0.5 to 1.5 per cent, the results being somewhat complicated by rainfall.

The displacement by water of nitrogenous and mineral materials contained in leaves, G. ANDRÉ (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 26, pp. 1528-1531; 156 (1913), No. 7, pp. 564-566).—In continuation of his investigations (E. S. R., 27, p. 525), the author gives the results of studies on the hydrolysis and solution of nitrogenous and mineral constituents in chestnut leaves when placed in water to which a little formaldehyde was added.

The results obtained are considered analogous to those following the autumn fall of leaves. It was found that the greater proportion of the nitrogenous constituents, phosphoric acid and potash was rather quickly leached from the leaves.

In 1912 similar experiments were carried on which confirmed the previous results. In addition reports are made on other mineral constituents. Only about one-fifth of the lime was removed from the leaves by exosmosis and about 40 per cent of the magnesia. Sulphuric acid was eliminated to a large degree, the combinations which it forms with minerals being such that they were readily soluble after the death of the leaves.

Experimental study of the effect of some nitrogenous soil constituents on growth.—Nucleic acid and its decomposition products, O. SCHREINER and J. J. SKINNER (*Plant World*, 16 (1913), No. 2, pp. 45-60, fig. 1).—The conclusions presented are essentially those previously noted from another source (E. S. R., 28, p. 324).

A note on the significance of sugar in the tubers of *Solanum tuberosum*, O. BUTLER (*Bul. Torrey Bot. Club*, 40 (1913), No. 3, pp. 110-118, pl. 1, figs. 2).—A study of the sugar which accumulates in the tubers of potatoes during the rest period, as influenced by temperature and oxygen supply, is reported upon.

The author considers the accumulation of sugar, so far as germination is concerned, as having no particular physiological significance. Potatoes were found to contain little or no sugar near their apices and sometimes nearly as much in their middle as in their basal portions, although frequently the greatest amount was found in the base of the tuber. From his experiments he believes that there is little if any translocation from remote to budding parts of the tuber even in germinating potatoes, and it seems that its appearance in quantity just before or at germination should be ascribed, in part at least, to metabolic changes induced by other agencies.

The principal rôle of manganese in the production of conidia of *Aspergillus niger*, G. BERTRAND (*Bul. Sci. Pharmacol.*, 19 (1912), No. 6, pp. 321-324; *abs. in Bot. Centbl.*, 122 (1913), No. 3, p. 63).—It is claimed to have been shown that there exists a ratio between manganese on the one hand and iron and zinc on the other in nutritive solutions at which growth of *A. niger* goes on but no development of reproductive organs takes place. It is said that if in case of a plant in this condition of arrest the proportion of manganese absorbed is increased, the fungus recovers its normal power to develop conidia.

The influence of boron compounds on plant growth, E. HASELHOFF (*Landw. Vers. Stat.*, 79-80 (1913), pp. 399-429, pls. 4).—As the result of investigations carried on for several years with water and soil cultures of corn, beans, oats, etc., the author concludes that, while some very low concentrations appear favorable and species show differences, boron exerts on these plants a prejudicial influence as to appearance and growth. This effect generally begins not far from the concentration of 1 mg. per liter of water in the nutrient medium, in case of boric acid and borax; but the increasingly injurious effects of these two compounds when added in successively larger proportions diverge to some extent, those of borax increasing generally the more rapidly. The amount of boron taken up by different plants showed a general correspondence to the degrees of injury observed. Apparently in case of oats, boron is taken up by the straw and not by the grain.

The rôle of oxidases in the formation of the anthocyanin pigments of plants, F. KEEBLE and E. F. ARMSTRONG (*Jour. Genetics*, 2 (1912), No. 3, pp. 277-311, pl 1, figs. 5).—In continuation of previous studies (E. S. R., 27, p. 632) the authors report on the distribution of oxidases in plant tissues and their rôle in the formation of pigments. The studies were made principally with Chinese primula (*Primula sinensis*), sweet william (*Dianthus barbatus*), and the garden geranium (*Geranium sanguineum*).

The investigations led to the conclusion that although oxidase is more widely distributed than chromogen, the distribution is in conformity with that required by the oxidase chromogen hypothesis. Owing to the existence of inhibiting substances, caution must be exercised in interpreting the negative results obtained by the use of oxidase reagents as proof of the absence of oxidases.

In considering the presence of oxidases in flowers, oxidase was found present in the petals of all colored and recessive white varieties of *P. sinensis*. The dominant white varieties contained an inhibitor of oxidase, the removal of which was followed by a strong oxidase reaction. Ever-sporting varieties of primulas and sweet william showed the most epidermal oxidase in the deeply pigmented flowers, less in those less highly colored, and none at all in the white flowers. Albino forms of primula, peas, and sweet peas all were found to contain oxidase, and their floral albinism is attributed to lack of chromogen. The white flowered geranium lacked oxidase, and it is believed that its albinism is due to this fact.

The authors summarize their results concerning the nature of the oxidases in flowers, stating that cells in which anthocyanin pigment is present contain oxidase in one of two forms, a peroxidase or a complete oxidase. The latter is found in the flowers of sweet william, geranium, and certain species of *Pyrus* and *Prunus*. Peroxidase is of more general distribution and occurs in primula, sweet pea, garden pea, and many other plants. The oxidase content of a plant was found to vary with external conditions. Tissues which are normally illuminated contain less peroxidase than corresponding tissues of plants kept in darkness. The organic peroxid constituent of the complete oxidase, though absent from the normal plant, makes its appearance after that plant has been kept for some time in complete darkness. Wound oxidases are said to resemble those which are concerned in the work of pigment production.

On the presence of diastase in certain red algæ, E. T. BARTHOLOMEW (*Abstr. in Science, n. ser.*, 37 (1913), No. 949, p. 382).—Various concentrations of extracts from a number of species of red algæ were used in testing cornstarch paste, and the results showed that although starch digestion was slower in the tubes treated with the algal extract than in those treated with commercial diastase, yet in time the digestion was complete. This appears to demonstrate the presence in the Floridæ of a diastase similar to that in green plants.

An optimum culture medium for a soil fungus, J. B. POLLOCK (*Abstr. in Science, n. ser.*, 37 (1913), No. 949, pp. 386, 387).—In collaboration with Miss Rose M. Taylor the author has carried on experiments to determine an optimum culture medium of known composition and of simple constitution. The experiments were conducted with *Myceliophthora sulphurea*, and 16 organic compounds were tested as to their availability for carbon, and incidentally for hydrogen and oxygen. Five compounds were tested for nitrogen supply, while magnesium sulphate was used in all cultures to supply magnesium and sulphur, and monopotassium phosphate to furnish phosphorus and potassium. The various materials were used in different proportions.

The medium in which the fungus was found to give the optimum results was saccharose 2/5 M, calcium nitrate 1/250 M, monopotassium phosphate 1/10–1/100 M, and magnesium sulphate 1/1000 M. Saccharose, it is said, has a decided advantage over both dextrose and maltose in that it can be obtained in a purer form, the ordinary rock candy to be obtained almost anywhere being more nearly chemically pure than the grades of maltose and dextrose which are usually designated as chemically pure.

Studies in bacteriological analysis of Indian soils, I, 1910–11, C. M. HUTCHINSON (*Mem. Dept. Agr. India, Bact. Ser.*, 1 (1912), No. 1, pp. 65, pls.

10).—In continuance of work with soil bacteria (E. S. R., p. 525), the author carried out extensive analyses of soils in the vicinity of Pusa, India, as to the kind and number of organisms present, as well as to their physiological activities, with results and conclusions which may be summarized as follows:

The numerical bacterial content of a given soil as well as bacterial activity therein, with resulting crop returns, may be greatly varied by conditions, and the sequence of their alternation. Examples of this are rainfall, preceded or followed by long drought; bacterio-toxins and influences affecting them, as sunlight, heat, aeration, etc.; protozoa and changes produced by and upon them; disinfectants and other means of bacterial limitation and selection; nutrient materials and their changes of availability as affected by various agencies; and physical character of the soil, and its alterations due to weather and to cultivation.

A study of weathering, that is repeated plowing of the soil during the hot and dry season previous to the first rain of spring as practiced with Indian soils, was made, the process being imitated by heating the soil up to a surface temperature of 60° C. and stirring daily. It was found that most fungi were eliminated, leaving such forms as *Bacillus subtilis*, said to possess superior ammonifying power, suggesting that this selective action may be one of the contributing causes of the resulting fertility. Weathering did not greatly alter the nitrifying power of the soil. Comparative experiments show no decided coincidence between the elimination of protozoa and increased ammonification. It is found that in the process of weathering, by which the soil becomes practically air dry to a depth of about 9 in., the anaerobic bacteria suffer almost total extinction, while the aerobic are affected in much less degree. It is stated that this may in part account for the increased fertility, but that it may also account for a certain loss of condition ascribed to a supposed disturbance of the balance of nature in the soils so treated. Toluene apparently increases the solubility of soils to air and bacterio-toxins gradually lose their toxicity in water solutions and on exposure to air and light, weathering producing an effect somewhat similar to boiling the soil extract. The effect of toluene upon the production of carbon dioxide was greater in proportion to the amount applied, suggesting that this was due to its action upon the physical or the chemical constitution of the soil. It is thought possible that certain toxins in the soil may be removed along with the soil wax said to be taken out by the toluene.

A considerable loss of ammonia was observed to follow weathering. It is suggested that the gradual air drying of successively lower layers of soil may carry downward a zone of optimum conditions for nitrification, ammonification, and other decay activities, resulting in the working over of a large portion of the organic matter present. It is suggested also that the air drying of this top 9 in. of soil results in preventing a wasteful degree of bacterial activity, thus in a measure compensating for the losses sustained in the escape of ammonia and carbon dioxide.

The conclusion is thought to be justified that the increase of fertility consequent upon partial sterilization must depend not upon any one but upon numerous complex factors, involving on the one hand the possibility of damage by depletion of organic nitrogen and carbon and the alteration of the soil flora, and on the other the rapid turnover of capital in the shape of organic nitrogen.

The process of weathering appears to afford a means of rapidly converting the nitrogen of green manures, root residues, and cattle manure into ammonia and nitrates; the ultimate effect depending upon the regulation of the ratio between supply and depletion of organic matter. It is thought that the effect of weathering on the water supply may also prove to be very important.

Further experiments are in progress to determine the ultimate effect of continued weathering upon the constitution of the soil complex, and the relation between alteration of the constitution of the bacterial flora and the ability of the soil to deal successfully with buried green manures.

On Actinomycetes in soils, I. F. MÜNTER (*Centbl. Bakt. [etc.]*, 2. Abt., 36 (1913), No. 15-18, pp. 365-381, pls. 3, figs. 3).—The author gives an account of investigations made on some soil-inhabiting fungi from widely separated localities in regard to their characters and life conditions. These studies include cultures made in nutritive solutions and sand, as well as on agar and gelatin, and relate to their growth, their utilization of various sources of nitrogen and carbon, and the influence of various degrees of acidity and alkalinity on their growth. The results obtained are detailed in tabular form.

The hypertrophied action of products elaborated by *Rhizobium radicola*, M. MOLLIARD (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 26, pp. 1531-1534).—Cultures were made of *R. radicola* from beans and the organisms grown in suitable media for several days. The liquid was then filtered through filter paper and porcelain to remove all organisms, and peas were grown with the aid of this filtrate. When so grown the roots showed hyperplasia in the pericycle and a hypertrophy associated with a malformation of the cortical cells. Where the liquid was first heated to 120° C. no such effect was noted, indicating that the substance secreted by the micro-organism was destroyed by heat.

An efficient electrical incubator, H. J. CONN and H. A. HARDING (*New York State Sta. Tech. Bul.* 29, pp. 3-16, figs. 5).—An apparatus for use in bacteriological work is described which provides for incubation at both high and low temperatures. It consists of 4 incubators of 7 cu. ft. capacity each, insulated with cork board, heated by electricity, and one of them cooled by the drip from a refrigerator. The incubators furnish temperatures between 19 and 50° C., while in the refrigerator a temperature of from 7 to 10° is obtainable.

The total cost of construction is estimated at less than \$400, and the cost of maintenance at less than \$40 per year. The advantages claimed for this type of construction are high efficiency, low first-cost and maintenance cost, and negligible fire risk.

FIELD CROPS.

[Field crops work at the Canadian experiment stations and farms in 1911], J. H. GRISDALE, C. E. SAUNDERS, F. T. SHUTT, J. A. CLARK, R. A. ROBERTSON, G. A. LANGEIER, W. C. MCKILLICAN, W. A. MUNRO, A. MACKAY, R. E. EVEREST, W. H. FAIRFIELD, G. H. HUTTON, and P. H. MOORE (*Canada Expt. Farms Rpts.* 1912, pp. 5-9, 63-80, 116-137, 147, 148, 155-157, 231-243, 251-260, 268, 269, 271-274, 283-296, 308-323, 341-345, 349-354, 361-379, 389-401, 411-416, pl. 1).—This continues work already noted (E. S. R., 27, p. 334).

The various farms conducted variety tests of spring and winter rye, spring and winter wheat, oats, 2- and 6-rowed barley, emmer, spelt, peas, field beans, maize for silage, sugar beets, turnips, carrots, flax, alfalfa, vetch, canary grass, potatoes, broom corn, forage crops, and mixed grasses, the results being reported in tabular form.

The comparative values of various crop rotations at the central farm, consisting essentially of meadow or pasture, roots or corn, and some cereal crop, have been studied, special significance being given to their value as soil improvers and their relative suitability for different lines of farming. The methods employed in each of these rotations are described and tabulated results are given. The net profits per acre from the various rotations ranged from

\$5.50 to \$9.62 per year, the most profitable being a 3-year rotation in which the first year from 12 to 15 tons of barnyard manure per acre is applied in winter, the soil plowed about 5 in. deep, and planted to corn; the second year oats, then seeded down to 10 lbs. red clover, 2 lbs. alsike clover, 6 lbs. alfalfa, and 6 lbs. timothy per acre; and the third year clover hay.

Results of germination tests of about 1,000 samples of wheat, barley, oats, and peas grown on the various farms are given. The maize when planted for silage, produced an average of 13 tons 1,668 lbs. per acre when planted in rows, and 15 tons 1,668 lbs. when planted in hills. From the analysis of broom corn it is suggested that when grown for broom manufacturing, this plant may be used as a by-product in the feeding of stock.

In a report of sugar-beet tests in various parts of the Dominion, the percentage of sugar in the juice varied from 11.72 to 18.7 per cent, and the yield of roots per acre from 3 tons 1,594 lbs. to 24 tons 1,104 lbs. in 1911. It is concluded that beets of excellent quality may be produced in many widely separated districts throughout Canada.

In an experiment with lime on swamp land on Prince Edward Island, in which applications of 5, 10, and 20 bbls. per acre were compared with no lime, buckwheat, barley, oats, rye, and wheat were used. In each case, except with the wheat, the best yields were obtained with the largest application of lime. With potatoes, omitting lime on the freshly cut sets was followed by a decreased yield of, on an average, 31 bu. 47 lbs. per acre with 15 varieties, and an increase of 26 bu. 34 lbs. per acre with 6 varieties.

In cultural experiments with corn at the Central Quebec farm, the yield per acre when drilled 8 in. between plants and 42 in. between rows was 13.89 tons as compared with 13.82 tons when 48 in. between rows. In 42 in. checks the yield was 11.92 tons and in 36 in. checks 11.33 tons.

In variety tests the amount of digestible protein produced per acre from the highest yielding varieties of winter peas was calculated to be 549.16 lbs., oats 308.16 lbs., mixed oats and barley 218.28 lbs., wheat 205.92 lbs., 2-rowed barley 166.32 lbs., and 6-rowed barley 146.16 lbs.

The results at the Manitoba farm in using grades of wheat from No. 1 hard to Nos. 1 and 6 Northern, and feed wheat showed yields ranging from 29 bu. per acre with the feed wheat to 39 bu. with the better grades. The results of a treatment of wheat seed to prevent smut are summarized in tabular form. Untreated seed showed 161 smutty heads per thousand, and a yield of 44 bu. 40 lbs. per acre. A higher yield, 48 bu. 40 lbs., was obtained with seed immersed in formalin, 1 lb. to 40 gal. of water, than in sprinkling or immersing in stronger solutions or treatment with bluestone.

Slightly larger yields of wheat followed the use of 2 bu. of seed per acre than with smaller quantities, but results with oats and barley were inconclusive. Seeding both wheat and oats to the depth of 2 in. gave better yields than 1, 3, or 4 in. The results of a soil packing experiment are summarized as follows: Unpacked 45 bu. 25 lbs. per acre; surface packer before seeding 51 bu.; combination packer after seeding 50 bu. 20 lbs.; subsurface packer before seeding 53 bu. 40 lbs.; surface packer after seeding 53 bu. 40 lbs.; combination packer after seeding 55 bu.; subsurface packer after seeding 54 bu. 40 lbs.; surface packer and harrow after seeding 54 bu.; combination packer and harrow after seeding 55 bu.; subsurface packer and harrow after seeding 54 bu. 40 lbs.; surface packer before and after seeding 53 bu.; combination packer before and after seeding 52 bu., and subsurface packer before and after seeding 55 bu. 20 lbs.

Early sowing of mangels apparently increased the yield over late sowing by about 2 tons per acre, and with turnips by about 4 tons by the early sowing. The fertilizing effect of clover was shown by yields of 37 bu. 5 lbs. of wheat following red clover sod, 33 bu. 30 lbs. following alsike clover, 27 bu. 37 lbs. following western rye grass, and 26 bu. 47 lbs. following timothy.

At the southern Saskatchewan farm, flax gave a better yield of straw, 1 ton 1.672 lbs. per acre, when planted May 30 than when planted May 5, but a better yield of grain, 34 bu. 36 lbs., from the earlier planting.

At the northwestern Saskatchewan farm, in a test of seeding spring wheat in quantities from $\frac{3}{4}$ to $2\frac{1}{4}$ bu. per acre, the yields of grain ranged from 2 bu. 5 lbs. per acre with the smallest amount to 5 bu. 20 lbs. with the heaviest seeding. A similar test was made with oats, but the plats were almost wholly destroyed by storm. Oats sown with the drill machine set at the shallowest notch gave better yields of grain than when set at the deepest notch.

At the southern Alberta farm, the average yield of 3 years for alfalfa, seeded at the rate of from 5 to 30 lbs. per acre, was heaviest with the 15-lb. rate, although closely followed by the 10 and 30-lb. seeding. Planting potatoes 2 ft. apart gave a relatively larger return than planting at 1 ft. On irrigated land, the highest average yield of wheat for 4 years was obtained by using 105 lbs. of seed per acre, whereas 90 lbs. of oats and barley is considered the most satisfactory. Comparisons of irrigated and nonirrigated land for growing seed potatoes were inconclusive.

At the central Alberta farm, substantially the same yields of winter wheat followed the use of $\frac{1}{2}$ bu. of seed per acre as with 2 bu., both being larger than those with intermediate rates. Seeding oats May 5 was followed by a yield of 67 bu. 2 lbs., as compared with 38 bu. 28 lbs., 42 bu. 12 lbs., and 35 bu. 10 lbs. from seedings May 13, 20, and 27, respectively. The average net profit per crop and per acre for 5 rotations tested ranged in 1911 from \$3.40 to \$17.92.

Tabulated data show that on the British Columbia farm the yields of corn were heaviest when sown 21 and 28 in. apart, but the stalks were much thinner, filled with water, and of much less value than the corn sown at 35 and 42 in. The labor of cultivating in drills was much greater than in hills.

[Field crop experiments], J. M. SCOTT (*Florida Sta. Rpt. 1912, pp. XXXI-XXXVII*).—This report includes trials of crops in which Yokohama beans, maturing in about 120 days, yielded at the rate of 1,408 lbs. of beans in the pod per acre; Japanese cane yielded in 3-year tests from 11.91 to 19.03 tons per acre, with sucrose in the juice ranging from 10.15 to 11.27 per cent; Natal grass in 2 cuttings produced 2,042 lbs. of cured hay per acre; guinea grass in 2 cuttings, 3,300 lbs.; Para grass in 2 cuttings, 2,760 lbs.; and kudzu grass, in 2 cuttings, 2,756 lbs.

With an application of 45 lbs. sulphate of ammonia, 50 lbs. muriate of potash and 175 lbs. acid phosphate per acre a yield was obtained of 366 lbs. seed cotton per acre, as compared with 312 lbs. following the substitution of 75 lbs. dried blood for the sulphate of ammonia. In some instances the use of 2,000 lbs. ground limestone per acre apparently increased the yield of Japanese cane 50 per cent the first year. The cultivation of the cane to depths varying between 2 and 6 in. showed little relation between the yield and the depth of cultivation.

Report of the agronomist, C. K. McCLELLAND (*Hawaii Sta. Rpt. 1912, pp. 74-82*).—This is mainly a progress report of experiments with cotton, rice, broom corn, grasses and forage plants, dry farming, and range improvement.

Samples of Caravonica cotton were submitted to a carding and picking test at a new England factory. Roller-ginned cotton suffered a loss of 7 $\frac{1}{4}$ per cent in shrinkage or waste as against a 9 $\frac{1}{4}$ per cent loss by the saw-ginned cotton.

The former loss was considered comparable with Peruvian cotton and valued at $\frac{1}{2}$ cts. more per pound than the saw-ginned sample.

An excellent quality of broom corn from 24 to 30 in. in length was produced in 90 days. The ratooning of broom corn proved a failure, as the yield was small and the quality inferior, each stalk having coarse central stems in the brush. Fall planting of broom corn also proved undesirable, as the brush from this crop likewise contained coarse stems, which the spring (April 4) planting did not. It is suggested that broom corn may be planted between the rows of corn in the spring.

Growing crops in western Nebraska, W. P. SNYDER and W. W. BURN (*Nebraska Sta. Bul. 135*, pp. 5-41, figs. 6).—This bulletin reports continuations of trials, previously noted (*E. S. R.*, 24, p. 723), with winter wheat, spring wheat, oats, barley, spring emmer, and corn, with regard to varieties, rate of seeding, time of seeding, and effect of previous crop and tillage. Reports on the production of sorghum, Kafir corn, milo maize, brome grass, and alfalfa are also presented, with data as to rotations and tillage methods.

It is noted as results of observations to date, that "summer tilled land has produced on an average 10 bu. more than twice that produced on land not summer tilled when sown to winter wheat. Turkey Red and Kharkov have given the highest yields and for this locality we consider them practically the same. Whenever there is a shortage of moisture thin seeding of winter wheat on summer tilled land has given the best results. Seeding winter wheat by September 15 except in dry years has given best average results in this locality. Early seeding of spring small grains has given the best average yields. Spring grains have given a heavier yield on summer tilled land than on land not summer tilled, but only in the case of barley has it been at all profitable to summer till for spring grains.

"Seeding oats, barley and emmer at 6 pk. per acre has given the best average results. In all spring small grains the earlier varieties have given the best average results. Common 6-row barley has proven the best of all varieties so far tested. Winter emmer has not proven hardy in this locality. Drilling small grain has in practically all cases given an increased yield over broadcasting.

"Durum wheat and barley have produced more feed per acre than other spring small grains. Listing corn has proven much more profitable than surface planting. Ordinary cane (sorghum) has proven the best annual forage crop. Brome grass has not proven profitable either as a pasture grass or as a hay crop. Alfalfa is the most valuable forage crop that can be grown in the valleys. On the table-land it is of questionable value when sown broadcast, except during years of abundant rainfall or when sown on some place which receives run-off water from adjacent land."

Charts, diagrams, and tables give data on precipitation at North Platte, Nebr., for the past 38 years, and on the rate of evaporation from a free water surface for the months of April to September for 5 years, ranging from 40,191 to 49,702 in.

[Field crops work at the Williston substation, 1910], E. G. SCHOLLANDER (*North Dakota Sta., Rpt. Williston Substa., 1910*, pp. 12-52, figs. 6).—Tabulated data are given of variety tests with wheat, oats, barley, flax, potatoes, and sugar beets. Velvet Don, a durum wheat, produced the lowest yield of 3.7 bu. in 1910 as well as the highest yield of 36.8 bu. per acre in 1909. Oats yielded from 3.6 bu. in 1910 with G. I. 492 to 104.1 bu. by the same variety in 1909. Barley yielded from 1.2 bu. in 1910 with success to 57.8 bu. by Russian in 1909.

Sowing wheat August 14 gave a higher yield than sowing August 27, September 11, or September 25.

The largest yield of potatoes was 128.9 bu. by Early Russet. Potatoes planted at depths of 4, 6, 8, and 10 in. produced best at 4 in., with an average total yield of 87.4 bu. per acre for the years 1909-10. Of different distances, rows at 3 ft. and hills 9 in. apart produced the best yield, 116 bu. per acre. Large whole seed tubers gave a higher yield, 99.3 bu. per acre, than smaller sized or cut tubers. With a straw mulch of 6 in., 116.7 bu. potatoes per acre was obtained as compared with 77.3 bu. with no mulch but planted 4 in. deep. Increased yields were obtained when winter cereals, oats, and potatoes were irrigated.

In 1909 the sugar beet crop gave an average of 14.95 per cent of sugar and in 1910, 20.19 per cent, while the average of 129 samples in 1891 was 11.43 per cent. The 1910 crop was irrigated.

It is noted that equal results have been obtained both with and without a nurse crop for alfalfa without irrigation, but a nurse crop is recommended when the crop can be irrigated. The results of irrigating alfalfa in 1909 and 1910 to determine the rate to apply the water only indicated the inadvisability of drawing conclusions from a 2-year trial, as it is stated that the largest quantity of water did not give the largest yields but served to drown out the crop.

[Field crops work at the Williston substation, 1911], E. G. SCHOLLANDER (*North Dakota Sta., Rpt. Williston Substa., 1911, pp. 11-54, fig. 1*).—This report covers variety and cultural tests and selection work by the centgener, rod row, and head row methods with cereals, and milling and baking tests with wheat. Sowing winter wheat August 16 gave better yields than sowing August 31, September 15, and October 1.

Experiments with potatoes, including variety tests and comparisons of different depths, dates, and distances of planting, sizes and number of eyes per hill, and cultivation versus straw mulch, were conducted as in 1910 (see above).

The 3-year average planting at a depth of 4 in. has given better results than 6 or 8 in. Potatoes planted May 11 yielded better than those planted April 27 or May 25. Rows 3 ft. apart with 12-in. hills gave better results than hills 18, 24, or 30 in., the maximum yield being 84.3 bu. Large whole seed tubers have given better results for the 3 years than smaller sized or cut tubers. Planting under 6 in. of straw again proved more favorable than planting 4 in. deep in soil.

Mention is made of experiments with brome grass, medium red clover, field corn, field peas, and alfalfa. Irrigation trials with winter wheat, potatoes, oats, sugar beets, and alfalfa gave increased yields with the use of water. Tabulated results show the effect of applying different amounts of water to alfalfa, and the amount of water used by growing alfalfa in tank experiments.

The 3 years' trials have given successful results by seeding alfalfa with a nurse crop. As in previous years, the importance of irrigating alfalfa at the proper time, i. e., when the crops need water, was again demonstrated.

Agriculture on the Yuma reclamation project, C. S. SCOFIELD (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 124, pp. 3-8*).—This paper gives an account of the conditions found in this valley of the Colorado River and points out the lines along which agricultural development will probably follow. The chief industries discussed are the growing of alfalfa for hay and seed, truck crops, cotton, live stock, orcharding, and such other crops as may be shipped long distances to market.

The Rothamsted Experiment Station, 1843-1911, A. D. HALL (*Trans. Highland and Agr. Soc. Scot., 5. ser., 24 (1912), pp. 138-180, figs. 4*).—This paper includes results of work previously noted (E. S. R., 8, p. 837), and covers the whole experimental period of about 68 years.

In regard to the continuous growth of crops of wheat, barley, and mangels on the same land, the author concludes that taking the results as a whole they show "that the wheat crop does not in any way unfit the land for the growth of another wheat crop provided the fertilizer supply is maintained. If there is any toxic effect brought about by the crop leaving behind in the soil substances which have an injurious influence upon another crop of the same kind, this effect is very small in the case of wheat, so small as to be negligible. Of course this does not mean that it is advisable as a matter of practical farming to attempt to grow wheat continuously upon the same land, because . . . there are mechanical difficulties introduced in the way of cleaning the land, and these difficulties are great enough to prevent the wheat on the Broadbalk field from reaching the level of production that we might expect from the fertilizers supplied to some of the plats."

The average yield for the last 10 years of continuous cropping, without fertilizers, was for wheat 10.9 bu., barley 9.2 bu., and mangels 3.68 tons per acre. In a rotation without manure since 1848, swedes produced 0.3 ton in 1908, barley 10 bu. in 1909, clover hay 17.4 cwt. in 1910, and wheat 24.5 bu. per acre in 1911. In the continuous cropping without manures the yield of wheat reached a minimum level of about 12 bu. per acre, below which it seemed to be sinking very gradually, depending upon the amount of nitrogen brought down by rains. The plat which received barnyard manure containing 200 lbs. of nitrogen reached a fairly constant level of about 38 bu. per acre, although an excess of nitrogen had been applied each year. During the 59 years 7,800 lbs. of nitrogen have been applied and 1,989 lbs. removed in crops. Yet an analysis of the soil showed an accumulation of only 507 lbs., so that estimating 150 lbs. as added in rain 5,454 lbs. was unaccounted for and regarded as lost to the crop. Some factor other than nitrogen must, then, have been the limiting crop-producing factor.

It is shown that *Azotobacters* play an important part in the fixation of atmospheric nitrogen in the presence of carbohydrates in the soil. Some of the plats that had received manurial treatment, but no nitrogen from 1867, showed only a slight decrease in nitrogen content and the yield of wheat averaged 31.2 bu. during a period of 46 years, while when the turnips in the rotation were turned under the soil maintained its initial percentage of nitrogen much longer and produced an average of 32.2 bu. of wheat. The *Azotobacter*, the author contends, fixed atmospheric nitrogen to a greater extent with the aid of the carbohydrates of the turnip crop turned under. Nitrogen determination of the soil showed, with the roots removed, in 1867, 0.1224 per cent; in 1874, 0.1147; 1883, 0.1161; and 1909, 0.1159; with the roots turned under, in 1867, 0.124; in 1874, 0.1238; in 1883, 0.1228; and in 1909, 0.1195 per cent.

In a 4-year rotation running for 60 years, turnips without manure produced in 1908 21.6 cwt., and under the influence of phosphoric acid applications 179 cwt. in the same year. Barley was also helped by phosphoric acid in its rotation, and the author connects this action with the shallow root system of these plants in which phosphoric acid acts as a stimulant to root growth and tillering. Phosphoric acid seemed to have a specially beneficial effect in a wet or cold soil and season as shown with the barley. In 1893, a very dry year, phosphoric acid apparently raised the yield from 11.6 to 18.1 bu. per acre, and in 1894, a very wet and cold season, from 10.4 to 34.9 bu.

Another indication of the need of certain crops for special food elements was in the case of mangels, potatoes, and legumes in their relation to potash. the yield being increased and often the quality of the product. Potash seemed to have a reverse effect in a wet season from phosphoric acid, apparently increasing the wheat yield from 11 to 16 bu. per acre in a wet season, but

from 7.7 to 16.4 bu. in a dry season. With barley there was an increase from 18.1 to 30.8 bu. in a dry season, while in a wet season the increase was only 6.5 bu.

[Variety and manurial experiments in Ireland], J. WILSON (*Trans. Highland and Agr. Soc. Scot.*, 5. ser., 24 (1912), pp. 3-39).—The author, in comparing the tabulated results with potatoes, mangels, turnips, oats, and meadow hay, points to the results as showing the beneficial use of commercial fertilizers. The highest profits, £5 7s. 6d., were received for mangels, with the greatest amount of commercial fertilizer (2 cwt. ammonium sulphate, 4 cwt. salt, and 4 cwt. superphosphate) in combination with 20 tons of barnyard manure per acre.

Report of a variety test with oats, spring wheat, field beans, fodder beets, and sugar beets, F. MERKEL (*Arb. Deut. Landw. Gesell.*, 1912, No. 223, pp. 319).—This report consists chiefly of tabulated results obtained in 1911 by numerous members of the German Agricultural Society in cooperative variety field tests, giving data as to the kind of soil, previous 3-year crops, amount and kind of fertilizer applied, date of seeding and harvest, amount of seed used, amount of damage by insects and fungi, weather conditions, yields, weight of 1,000 kernels and of 1 liter of grain, and percentage of hulls of each of the numerous varieties grown.

[Wheat, oats, and potato tests], A. DESPEISSIS (*Dept. Agr. and Indus. West Aust. Ann. Rpt. 1911*, pp. 8-11).—Tabulated results of yields of numerous varieties of wheat show a yield of from 6.1 to 26.6 bu. of grain per acre, or when cut for hay a yield of from 2 to 3 tons per acre.

In a manurial test, using quantities purchasable for the same amount, an expenditure of 8s. 3d. for 224 lbs. superphosphate was followed by a yield of 15 bu. of wheat per acre, as compared with 15.5 bu. following the use of 280 lbs. basic slag.

The use of 168 lbs. superphosphate was followed by a yield of 13 bu. and that of 210 lbs. basic slag by 11 bu., while the respective yields with 112 lbs. superphosphate and 140 lbs. basic slag were 12 and 10.5 lbs.

Yields of oats varieties, ranging from 9 to 20 bu. per acre, are also given. An average yield of potatoes of 3 tons 4 cwt. per acre was obtained, as compared with 5 tons 15 cwt. in Great Britain, 3 tons 18 cwt. in Ireland, and 7 tons 3 cwt. in Scotland.

Annual report of the Dumraon Agricultural Experimental Station, 1911-12, G. SHERRARD (*Ann. Rpt. Dumraon Agr. Sta. [India]*, 1911-12, pp. 13).—Experiments showed the gain in yield of sugar cane to be as high as 1,380 lbs. per acre by the trench method of planting in comparison with the local systems. Cow manure ashes apparently increased the yield of rice 1,100 lbs. of grain and 4,165 lbs. of straw per acre over the unmanured plots, whereas green manuring increased the yield 1,076 lbs. of grain and 4,715 lbs. of straw per acre.

Tabulated results of fertilizer and variety tests of rice, and variety tests of wheat and mustard are also given.

Legume inoculation, M. J. PRUCHA (*New York Cornell Sta. Circ.* 15, pp. 25-32, figs. 5).—This circular discusses briefly the essential facts as to inoculation of legumes and calls attention to the pure cultures which the department of plant physiology is now distributing.

Report of assistant botanist, J. BELLING (*Florida Sta. Rpt. 1912*, pp. CXY-CXV).—This paper reports of planting the second generation of seeds procured by crossing the Velvet and Lyon beans, continuing earlier work (E. S. R., 27, p. 338).

The failure of 43 per cent of the plants of the second generation of this cross to mature under the existing climatic conditions was the instigation to perform an experiment based upon automatic elimination of weak plants. The beans were planted in a young sorghum field where the struggle for existence was strong enough to crowd out the weak plants. The observations and discussions in this paper have to do chiefly with the survivors of the different groups with respect to the relation between the vigor of the various plants and their dominant or recessive characters. In the selection of the seeds of the second generation for this planting, frosted pods, low yields, and stinging hairs were characters upon which rejection was based.

It is noted that among the first 1,100 seeds, only one-tenth of the young plants survived to maturity, and out of 6,003 seeds only 740 surviving plants bore pods. On the whole, there appeared to be a selective elimination of plants with certain recessive characters. This elimination caused the surviving offspring in any family to mostly resemble their parent, and often concealed the fact of gametic segregation. There was evidence that the recessive character of black shoots and smooth pods was accompanied by less vigorous growth. The differences of pod lengths in the different parents were mostly repeated in the third generation. The high breadth-length index of the seeds of many plants was probably in great part or wholly, determined mechanically by the shortness of the pods, and the consequent pressure on the growing seeds. In the third generation the seed shape was obviously inherited in the majority of the surviving progeny of each family.

Further work in progress with crossing flint and dent corn to secure a type more adapted to Florida conditions (E. S. R., 25, p. 436) is noted.

Effects of cross-pollination on the size of seed in maize, G. N. COLLINS and J. H. KEMPTON (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 124, pp. 9-15*).—This paper reports the results of cross-pollinating varieties of corn, including Missouri Cob Pipe, Gracillima, Variegated, Hickory King, Mexico Black, and Algeria. Pollination was performed in such a way as to utilize the principles of xenia to detect the pure and hybrid seeds on the same ear for comparison. The silks of white-seeded varieties were dusted with a mixture of pollen of the same white variety and pollen of a different variety of colored seeds, thus producing pure and hybrid seeds on the same ear.

In every instance the size of the seed was materially increased by the foreign pollen, the increase ranging from 2.8 to 21.1 per cent. It was noted that the rate of increase bears no direct relation to the size of seed in the variety used as the source of pollen. No differences in specific gravity of pure and hybrid seeds from the same ear could be detected. The author points out that the increase in weight of the seeds thus secured may be due to the stimulation by foreign pollen, and has more than scientific value.

Corn production, O. D. CENTER (*Ann. Rpt. Ill. Farmers' Inst., 16 (1911), pp. 94-102*).—The author in this address points out the difference between maintenance production and profitable production. He considers vegetable matter in the soil the chief factor of large crop production, with crop rotation with a legume as the foundation, and its proficiency based upon the lime content.

Grow corn that will ripen, J. H. SLEPPER (*Wallaces' Farmer, 38 (1913), No. 12, p. 545*).—In this article the author emphasizes the importance of planting a variety of corn that will surely ripen, quoting analyses by the North Dakota and New York State stations showing the increased digestibility at maturity. He considers it a mistake to grow corn, even for silage, that will not reach the glazing stage of growth before there is danger of killing frost.

The wild prototype of the cowpea, C. V. PIPER (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 124, pp. 29-32*).—This paper continues the discussion of the origin

of the cowpea (E. S. R., 19, p. 231; 26, p. 635) based upon new data bearing on the habitat and the botanical characteristics of *Vigna* found in Africa, which seems to bring *Vigna sinensis*, *V. catjang*, and *V. sesquipedalis* into one and the same species. The author concludes that the wild African plant, *V. sinensis*, with blackish scabrous pods and scabrous leaflets is the original wild form of our cultivated cowpea.

A comparison of the Mammoth and Spanish peanuts as grown in central Iowa, H. W. CLARK (*Science*, n. ser., 36 (1912), No. 928, pp. 488-490).—A strain of a Virginia peanut, known as Mammoth, was planted on May 8 in comparison with a small prolific Spanish peanut. Similar treatment was given throughout the season, and both were harvested on October 23, the date of the first killing frost. Tabulated measurements of the nuts and kernels of both varieties are given. The Mammoth peanut gave a little more than 68 per cent larger yield of kernels.

Good seed potatoes and how to produce them, W. STUART (*U. S. Dept. Agr., Farmers' Bul. 533*, pp. 16, figs. 8).—The author discusses the production of the potato in the United States since 1868, and describes methods of selecting good seed tubers, including the tuber-unit method, previously described (E. S. R., 28, p. 835). It is suggested that high-grade seed would increase the return of the potato crop of the country by many million dollars, and that all seed should be treated with formalin solution.

Changes in Irish potatoes during storage, C. O. APPLEMAN (*Maryland Sta. Bul. 167*, pp. 327-334).—This bulletin gives results of investigations to determine the "relation of temperature to starch and sugar transformations; changes due to respiration and its dependence upon external and internal factors; causes of loss in weight; and effects of sprouting." Data are arranged in tabular form.

It was found that "sugar accumulates in potatoes at the expense of the starch when the temperature falls to 38° F. The rate of accumulation is most rapid between 32 and 29°. Potatoes exposed to the above temperatures for only a few days will show a very slight sugar accumulation. A long exposure is necessary before the accumulation becomes significant. The maximum of from 3 to 4 per cent is reached in from 4 to 6 weeks. Freezing does not begin until the temperature is between 28 and 26°. If potatoes, which have become sweet through long exposure to low temperature, are brought into a room of 70 to 75° for a week, about four-fifths of the accumulated sugar will be converted back into starch; the remaining fifth will be lost through respiration. A longer exposure of 3 or 4 weeks in the cellar or vault after the temperature has risen to 45 or 50° will remove most of the accumulated sugar.

"Respiration converts starch and sugar into water and carbon dioxide. This process is continually going on in stored potatoes. The rate of respiration is influenced most by temperature. It increases as the temperature rises within certain limits and gradually decreases as the temperature falls, becoming very weak just above the freezing point. The rate of respiration is also accelerated by accumulated sugar, germinating buds, moisture, and light. . . . The heating of potatoes in large heaps or bins is due to high respiration and poor ventilation. . . .

"Potatoes lose in weight during storage, due to evaporated water and respired carbon dioxide. Warm, dry conditions favor evaporation. Loss by carbon dioxide is greatest at high temperatures. Under similar conditions loss in weight is much greater right after digging than during the winter months. The rate of loss increases again with sprouting and warm weather. Starch, sugar, and proteins are rapidly depleted in sprouting potatoes. The minimum sprouting at the end of the rest period will occur under cold, dry condition. Removing the sprouts repeatedly does not seem to weaken the buds for seed. . . . A storage

temperature slightly above freezing is best for seed potatoes, but for culinary purposes a moderately dry, well-ventilated cellar or vault, with a temperature ranging between 38 and 42° F. is preferable."

The determination of sulphur and chlorin in the rice plant, ALICE R. THOMPSON (*Hawaii Sta. Rpt. 1912, pp. 67-73*).—This paper has for its purpose to show the sulphur and chlorin "content of the parts of the rice plant at 3 stages of growth, and to determine the effect, if any, of fertilizer on the sulphur and chlorin composition of the plant grown in natural soil conditions and in sand cultures; also to determine the amounts of sulphur and chlorin contained in the rice field soil and water. The phosphoric acid content of the plant has been given in a previous publication [*E. S. R., 24, p. 635*]."

The method of analysis for total sulphur was Hart and Peterson's (*E. S. R., 25, p. 519*) modification of Osborne's method (*E. S. R., 13, p. 521*). It was found in making the sulphur determination that especial care must be taken with reference to the influence which gas burners have on the results. It is advisable to make the sulphur determination in a room shut off from gas fumes, and to fuse and boil over alcohol lamps.

The mineral sulphur was determined by stirring the sample with 100 cc. of cold 1 per cent hydrochloric acid solution, and allowing it to stand an hour before filtering. When the starchy materials were examined, the sample was first boiled in the hydrochloric acid solution to render it soluble. This produced no hydrolysis of the sulphur. Chlorin was determined by the Volhard method. "The samples of rice plants for this work were collected March 23, April 19, and May 15, 1912, 10 clumps of the plants being selected from each of 2 plats at the trial grounds. The first series of plants was taken before the flowering and divided into foliage and roots for analysis. The second series was taken at the time of full-stage flowering and divided into panicles, leaves, stems, and roots. The third series was taken at maturity and divided into grain, chaff, leaves, stems, and roots."

In studying the composition of the rice plant at the first harvest, 2 plats were used, one unfertilized check plat, the other fertilized with ammonium sulphate, superphosphate, and potassium sulphate. At this time the percentage of sulphur is higher than at any other period of growth, and is about equally distributed between the foliage and roots. The unfertilized plat showed about 0.1 per cent higher than the fertilized plat, but this is probably due to the larger size and greater growth of the plants which were fertilized. "The percentage of mineral sulphur is highest in the roots, being almost 4 times as high in the roots as in the foliage, but it is much less than the total sulphur, showing the formation already made of organic sulphur in the plant. Chlorin is also highest at this first period and, like sulphur, is found in largest percentage in the roots."

At the second harvest there was practically no difference in the composition of the plants, although the fertilized plants were much larger and heavier. "The percentage of sulphur in the total plant has decreased from the first period, the leaves having the highest content in sulphur, the stems the lowest. No mineral sulphur was found in the panicles, but this form was relatively high in the roots and leaves. Chlorin had also decreased in percentage amount and was quite low in the panicles and high in the roots. At the third harvest the fertilizers show no effect on the composition of the plant. Total sulphur is very small in the stems and chaff, and about 0.23 per cent in the other parts of the plant. Mineral sulphur is found only in the roots, showing that the plant had used up the mineral sulphur in the formation of organic material. Chlorin is practically absent from the grain, though high in the stems.

"Mature rice plants from plats under different fertilizer conditions [i. e., check; sulphate of potash, superphosphate; ammonium sulphate, sulphate of

potash; ammonium sulphate, superphosphate; ammonium sulphate, superphosphate, sulphate of potash; ammonium sulphate] were selected, 10 clumps from a plat, and analyzed separately to determine any influence of fertilizer on the sulphur, chlorine, phosphoric acid composition on the straw and paddy of rice." No difference in the sulphur or chlorine composition of the plant was noted, although the ammonium sulphate plat showed a slight depression of the phosphoric acid absorbed by the plants.

The possibility of sulphur fertilization being required by a crop that absorbs about half as much sulphur as it does phosphoric acid for organic material is pointed out. A partial analysis of the soil from the rice trial grounds of the station is shown. "The results indicate that the sulphur in the soil is present largely in organic form, since the acid soluble and water soluble sulphur are relatively so small. No trace of sulphid was found on boiling the soil with hydrochloric acid. Doubtless the presence of large amounts of iron in the soil results in the formation of insoluble basic compounds of sulphur, and this may explain the noneffect of sulphur fertilizer on the composition of rice plants grown in the soil, for . . . in silica sand cultures the composition is much affected. . . . The soil contains an abundance of phosphoric acid but no large amount of chlorine." The water entering the rice field showed a SO_2 content of about 9 parts per million, and a chlorine content of about 70 parts per million.

Samples of rice grown in pot cultures in the nitrogen work previously reported (E. S. R., 26, p. 41) were also compared with plants grown in the trial ground. The plants in the pots had received in addition to a basic fertilizer lacking nitrates, calcium sulphate and several forms of nitrogen. No consistent influence could be noted in the sulphur of the plants grown in the pots containing trial ground soil, but "in those plants grown in the silica sand pots, the total sulphur content is higher in every case and constantly higher when the soluble ammonium sulphate was the fertilizer added." The increase in total sulphur is deemed undoubtedly due to the absorption of mineral sulphur by the plant. The phosphoric acid content was fairly constant through the series of plants.

For the purpose of verifying results obtained with the pot plants, some further experiments were made with silica sand pots. "The chlorine absorbed was about twice as high as that absorbed by the rice plant grown in normal soil conditions. These results with silica sand cultures show the sulphur fertilizer is not rendered insoluble to the plant as is the case in soil cultures. They show the probability of the absorption of ammonium sulphate as such by the rice plant as so much mineral sulphate is found in the foliage, and free ammonia was determined in the water solution of 2 rice plant samples."

Some determinations of phosphoric acid in solutions obtained from sulphur determinations by fusion with sodium peroxid were made, the molybdic precipitate being dissolved and reprecipitated for the purpose of removing the silica. The results compare favorably with those obtained by ignition with the magnesium nitrate (official) method. By comparing the results obtained by boiling samples of straw and grain with hydrochloric acid and nitric acid with those obtained by boiling with sulphuric acid and potassium nitrate, it is seen that the 2 methods, when applied to the straw, are not greatly different, while those obtained by boiling the grain with aqua regia until a colorless solution results, are about one-third as high as those obtained by the sulphuric acid and potassium nitrate method. "Although the solution of the grain obtained by boiling with hydrochloric acid and nitric acid becomes practically colorless, organic matter is still present, as shown by the charred mass that results if it is boiled to dryness. The starch may be oxidized to some organic acid that resists oxidation and interferes with the precipitation of the phosphomolybdic precipitate."

Sudan grass, a new drought-resistant hay plant, C. V. PIPER (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 125, pp. 20, figs. 6*).—This circular gives the history of the discovery and introduction of this grass, or "gawari," into the United States in 1909, and reports at a large number of experiment stations and by farmers the results of trials which indicate that it will be a valuable hay plant, especially for the semi-arid regions. At Chillicothe, Tex., 4 cuttings in a season yielded at the rate of 4.4 tons hay per acre. Analyses are given showing the composition of the Sudan hay cut at different stages of maturity. It grows from 3 to over 6 ft. high.

Tunis grass is also described, but is apparently of much less value than Sudan grass.

Instructions for conducting comparative experiments with the different varieties of sugar beets, E. ZALESKI (*Anleitung zur Ausführung Vergleichender versuche mit Verschiedenen Zuckerrübensorten. Krakow, 1912, pp. 33, tables 5*).—This work takes up the sources of error that may occur in field work and in calculations, and discusses remedies and offers mathematical formulas to aid in apportioning the probable errors in computing the results for the most accurate comparison.

The world's sugar production, with statistics, S. ZIEGLER (*Die Zuckerproduktion der Welt und ihre Statistik. Brünn, 1912, 2. ed., pp. VII+90*).—These statistics cover production and consumption of all sugar-producing countries from 1902–1911. Part 1 discusses the cane sugar industry, and part 2 the beet sugar industry, with a chapter on storage and movement in European markets.

Fertilizer experiments with taro, W. McGEORGE (*Hawaii Sta. Rpt. 1912, pp. 56–58*).—The maximum yield reported, 1,751 lbs. of taro per acre (having 57.6 per cent of poi), was obtained with an application of 400 lbs. nitrate of soda, 450 lbs. superphosphate, and 400 lbs. sulphate of potash. A poi content, however, of 74.6 per cent followed the substitution of 300 lbs. ammonium sulphate for the nitrate, with a yield of 1,702 lbs. per acre. This indicated that the nitrate of soda produces a bulb of greater weight and volume, but in so doing causes a decrease in the carbohydrate content.

Quebec experimental tobacco stations, 1911, O. CHEVALIER (*Canada Dept. Agr., Tobacco Div. Bul. A13, pp. 19*).—This bulletin reports work in progress at the St. Jacques and St. Césaire stations, covering selection of seed plants, notes on beds, the growing of Turkish tobacco in Canada, chemical fertilizers, rotations, and Cuban tobacco, with analyses of Quebec and Ontario soils.

In various methods of cultivation with the Cuban tobacco, the greatest yield was obtained when 1 bud was left to every leaf, being 774 lbs. per arpent (921 lbs. per acre).

The culture of tobacco in Gironde, A. TRICHEREAU (*Vie Agr. et Rurale, 1912, No. 13, pp. 326–330, figs. 5*).—This article describes the method of growing the Paraguay variety of smoking tobacco. An experiment is cited, in which an application of 33.3 francs worth of Thomas slag per tract apparently produced an increased valuation of 361.7 francs of tobacco.

Vetch growing in the South Atlantic States, A. G. SMITH (*U. S. Dept. Agr., Farmers' Bul. 529, pp. 21, figs. 6*).—This describes 3 varieties of vetch commonly grown in the South, viz. *Vicia angustifolia*, *V. sativa*, and *V. villosa*, and discusses the fertilizing value of vetch, the time for planting, quantity of seed required, inoculation, production of vetch hay, vetch silage, vetch seed, and vetch honey, and gives rotations including vetch for bottom lands, uplands, cotton farms, and dairy farms.

Durum wheat, C. SALMON and J. A. CLARK (*U. S. Dept. Agr., Farmers' Bul. 534, pp. 16, figs. 4*).—The authors give the dates of introduction of durum

wheat into this country, and the characteristics, areas, and uses to which it is adapted, and discuss the culture and improvement of this crop. As the best varieties are mentioned Kubanka and Arnautka, which are especially described. It is noted that in North and South Dakota, areas in which this wheat is best adapted, it has yielded from 15 to 50 per cent better than the standard Fife and Bluestem varieties. The available data indicate that durum wheat, despite its hardness, has a commercial value at least equal to the best grades of common wheat.

HORTICULTURE.

Report of the horticulturist, J. E. HIGGINS (*Hawaii Sta. Rpt. 1912, pp. 35-44, pls. 3*).—The work of the horticultural department was largely along lines indicated in the last report (E. S. R., 27, p. 142), especial attention being given to the avocado, mango, pineapple, and papaya. The results of pineapple studies have been included in a recent press bulletin on The Pineapple in Hawaii (E. S. R., 28, p. 48).

Considerable attention was given during the year to the propagation and grafting of young avocado and mango seedlings and the method of procedure is here described. A new injury resulting from the fungus *Glœosporium* was observed in a number of the avocado seedling inarches which were found dying back from the wound made in cutting off the scion or the top of the stock. The use of some antiseptic covering on the wounds is advised. The wood-boring beetle (*Xyleborus immaturus*) made its appearance in the avocado orchard during the year, but was successfully combated by pruning and by the use of a wash composed of 1 gal. of soft soap, 3 gal. of water, and $\frac{1}{2}$ pint crude carbolic acid, applied to the trunks and branches with a whitewash brush.

Observations of the time required for the bearing of budded mangoes indicate that the trees will come into bearing at from $2\frac{1}{2}$ years to about 3 years from budding, depending on the varieties. The mango is being very seriously attacked by the Mediterranean fruit fly (*Ceratitis capitata*). None of the varieties appear to be immune from attack, but certain varieties, such as the Smith and several of the Cambodian type, locally known as "Chutney" varieties appear to be attacked only slightly and chiefly when the fruit is very ripe. When such varieties are picked before the fruit has begun to soften, the fly can be avoided to a considerable degree. To protect the more susceptible varieties it has been necessary to cover the fruits with cotton bags.

Breeding work with papayas is being continued. Observation of a series of graduations between the monoecious and dioecious types inclines the author to the opinion that the dioecious type was the more primitive and gave rise to the monoecious. Staminate trees bearing fruit in large numbers have been raised from seed procured from solitary fruits found growing on staminate trees.

In connection with the California quarantine against the Mediterranean fruit fly, Hawaiian shippers were compelled to abandon banana leaves as a wrapper for the bunches. Rice straw was used as a substitute for the banana leaves but was found to discolor the rind of the fruit. This trouble has been overcome to a considerable extent by the use of either a paper or a cheese-cloth wrapping inside of the rice straw. Experiments conducted by the station indicate that scale insects and mealy bugs which infest the banana bunches may be readily killed by fumigating with hydrocyanic acid gas and without injury to the fruit. It is believed that the injuries reported from the treatment of bananas with this gas in San Francisco may be due to the moist condition which the bananas are in after a 6 days' voyage on the ship, since hydrocyanic

acid gas appears to be especially injurious to tender plant tissues when they are wet.

In the work with the hibiscus, V. S. Holt in charge, a large number of new varieties have been originated and are under observation. Over 25,000 cuttings have been distributed. Ruth Wilcox, one of the most attractive sorts, is here illustrated and is said to be one of the few hibiscuses which emit a delicate perfume.

The work in the citrus orchards consisted principally in observations of varieties coming into bearing. Cultural tests of Bermuda onions conducted at the Homestead substation and in several other parts of the island of Kauai indicate that first-class marketable onions may be grown in the sandy and loamy soils. When grown in the heavy clay soils, on the other hand, a serious disease was prevalent, which appeared to be identical with the bacterial disease of this crop, known as "center rot" or "slippery onions," previously reported at the New York State and Georgia stations (E. S. R., 12, p. 55; 13, p. 53).

Horticultural work at the Canadian experiment stations and farms in 1912, J. H. GRISDALE, W. T. MACOUN, F. T. SHUTT, ET AL. (*Canada Expt. Farms Rpts. 1912*, pp. 9-12, 18-23, 87-111, 157-164, 260-263, 274-279, 301-305, 323-333, 346, 347, 355, 356, 384, 385, 401-408, 418-422, pls. 2).—This is the customary progress report on breeding, cultural, and varietal experiments with fruits, vegetables, ornamental trees and shrubs, etc., being conducted at the Central Farm, Ottawa, and the various branch experiment stations and farms in Canada (E. S. R., 27, p. 343).

Full descriptions are given of the most promising seedling fruits received for examination at the Central Farm during the year, and of 19 additional named varieties of apples originated at the farm. A survey of the McIntosh seedlings shows them to be especially promising since they have inherited to a large degree the good qualities of the McIntosh. Descriptions are given of 3 new seedling plums, together with 4 of Hansen's hybrid plums which are being tested.

Extensive variety tests of tomatoes under glass were started during the year and the results of the first season are presented in tabular form. In the work with ornamentals considerable attention has been paid to roses, with special reference to hybrid tea roses suitable for growing in Canada. Suggestions are given on the culture of hardy roses, together with a list of the best varieties of various types, including data on hybrid roses tested at Ottawa. Analyses of lime-sulphur washes and various insecticides are reported.

The work at the branch experiment stations and farms has thus far largely consisted of adaptability tests of different varieties of fruits, vegetables, ornamentals, etc. A new commercial apple orchard was established at the experimental farm in Nova Scotia. Cost data are here given of the first year's operations and are to be followed by similar data from year to year.

Report of the assistant horticulturist, C. J. HUNN (*Hawaii Sta. Rpt. 1912*, pp. 45-50, pl. 1, fig. 1).—A brief survey of horticultural operations for the year including orchard plantings, spraying, mapping, plant accessions and distributions, record making, etc., together with a descriptive account of a new insect-proof glass house and other new horticultural buildings and equipment.

Report of the horticultural testing fields from 1907 to 1911, R. P. BONTHUIS (*Verlag. en Meded. Dir. Landb. Dept. Landb., Nijv. en Handel, 1913*, No. 1, pp. 1-76).—This comprises a report on various experimental tests with fruits and vegetables conducted under the direction of the Netherlands Government during the period 1907 to 1911. They include fertilizer, variety, cultural, income, spraying, and pollination experiments.

Tin cans versus pots for seedling plants, E. V. WILCOX (*Hawaii Sta. Press Bul.* 41, pp. 8, pgs. 2).—Observations of young seedling plants, such as papaya, mango, avocado, etc., have shown that they grow more rapidly and with greater vigor in tin cans than in ordinary florist's pots. The author here reports a series of experiments conducted to determine the cause of difference in growth. Special attention was paid to a study of the factors of evaporation and stimulation due to the tin and solder of the cans. A portion of the pots and cans was paraffined in order to render the above factors as nearly alike as possible in both kinds of containers. Observations were made of the loss of water by evaporation and transpiration, and measurements were made of plant growth in the different containers.

The results of these experiments show that it is impossible to maintain the moisture content of the soil in florist's pots as uniform as in tin cans, at least without watering them 3 or 4 times daily. In these experiments 5-in. pots containing 760 gm. of soil lost about 29 gm. of water daily by evaporation, while tin cans holding the same amount of soil lost about 12 gm. daily. The lateral movement of water through the side of the pot tends to bring the roots to the outside wall of soil where the variation in moisture content is greater. It was found that plants grown in untreated tin cans showed a better color and a more rapid growth than those in paraffined cans. Hence, it is concluded that the better growth of plants in tins is due in part to the more uniform moisture conditions and in part to a stimulating effect of the tin itself.

Since porous flower pots must be imported into Hawaii at great expense and danger of breakage, the above results appear to warrant the use of rejected tin cans from the pineapple canneries, where they may be obtained at little cost. It has been found in practice that where plants in pots require watering every day, plants in cans will thrive well when watered every third day.

Suggestions on preparation and use of spray formulas, G. M. BENTLEY (*Tennessee Sta. Bul.* 99, pp. 61-82, figs. 7).—This bulletin comprises a compilation of suggestions on the preparation and use of various insecticidal and fungicidal formulas. The subject matter is discussed under the following general headings: Preventives, insecticides for biting insects, insecticides for sucking insects, combined insecticides and fungicides, fumigants, fungicides, spraying to kill weeds, and herbicides. Concise directions are also given for the treatment of insect pests and fungus diseases, together with the restrictions that have been made on the shipment of various articles coming from any State partially infested with the Mexican cotton boll weevil.

The composition of irrigated and nonirrigated fruits, J. S. JONES and C. W. COLVER (*Idaho Sta. Bul.* 75, pp. 53).—This bulletin reports an analytical study of orchard and small fruits, with special reference to the effect of irrigation on those compounds which materially influence quality in fruit. Although the attempt has been made to compare similar varieties of fruits growing both under irrigation and nonirrigation, data were secured with regard to as many varieties as possible whether grown under both conditions or not. The principal determinations made include total solids, acidity, invert and cane sugar, nitrogen, ash, and waste. The leading commercial districts of Idaho were represented and all samples were grown at elevations less than 3,000 ft. The analyses are here grouped and discussed under the 3 divisions of drupaceous, pomaceous, and small fruits.

Summarizing the results it appears that there is a fairly well-defined tendency for apricots, cherries, nectarines, peaches, plums, and prunes to elaborate greater percentages of solid matter when grown in the nonirrigated sections. With the exception of Italian and Petite prunes, however, such differences in sugar and acid are too small to seriously affect taste. There was a remarkable

uniformity of composition within each of the several varieties of apples analyzed. The nonirrigated varieties contain slightly greater percentages of acid and sugar, but the differences practically disappear when these constituents are calculated to the dry or solid matter. Apples grown with irrigation contain the smaller percentage of solids insoluble in water, and the nonirrigated apples containing appreciably higher percentages of crude protein, and consequently may have a slightly higher actual food value. In intensity and uniformity of color, also in percentage of waste, irrigated apples are somewhat superior to the nonirrigated.

With the exception of strawberries there were but slight differences in percentage of solid matter and in the total sugar content between the irrigated and nonirrigated small fruits. The nonirrigated small fruits, however, contain appreciably greater percentages of acid and of crude protein.

From a survey of the analytical results as a whole the authors are led to conclude that fruits in general manifest a well-defined tendency to elaborate greater percentages of total solids or dry matter, consequently of sugar, acid, and crude protein when grown in nonirrigated sections, but that with comparatively few exceptions no marked difference between irrigated and nonirrigated fruits in actual food or market value should be charged to differences in composition.

[Orchard and small fruits], E. G. SCHOLLANDER (*North Dakota Sta., Rpt. Williston Substa., 1911, pp. 10, 11, figs. 2*).—A brief statement of the fruits that have been grown on the station grounds to date, including the varieties that have proved the hardiest and have given the best satisfaction.

Apples and peaches in the Ozark region, H. P. GOULD and W. F. FLETCHER (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 275, pp. 95, pls. 6, figs. 6*).—In continuation of previous fruit district investigations (*E. S. R., 24, p. 441*) this bulletin reports a study of the Ozark region with reference to the behavior of different fruit varieties, especially the apple and peach, in different parts of the region, the conditions under which they attain satisfactory development, and the adaptability of each variety for the purpose intended.

The Ozark region is described with reference to location and topography, soil, climate, transportation facilities, and present pomological status. The principal varieties of apples and peaches grown in the Ozark region are described, and lists are given of varieties for Arkansas and for southern Missouri. Phenological records compiled from data secured from a large number of cooperative observers are given for the more important varieties of apples and peaches.

[Citrus experiments], S. E. COLLISON (*Florida Sta. Rpt. 1912, pp. XXXVIII-XLIII, fig. 1*).—In continuation of previous reports (*E. S. R., 27, p. 344*) measurements are given showing the average gain in diameter of trees from June 7, 1909, to May 6, 1912, growing on various fertilizer plats in the citrus experimental grove. Rainfall and temperature records for the year are also given.

No striking differences in results have been secured from any particular fertilizer thus far. The clean culture plats are still above the average in appearance. The check plats made slightly less growth than in the previous year. Excessive amounts of fertilizer have failed to stimulate tree growth. It was found that the die-back disease is more prevalent in certain well-defined areas in the grove but there appears to be no relationship between these areas and the character of fertilization. An investigation of the soils of the different areas is in progress to determine whether any relationship exists between the composition of the soil and presence or absence of die-back. Some attention was also paid during the year to a study of the effect of fertilization

on the acidity of the soil of different plats, and data are given showing the comparative acidity of a number of the plats. One of the points to be noted is the alkalinity of those plats receiving lime in some form. Lime as ground limestone, air-slaked lime, or hardwood ashes has proved equally effective in neutralizing the acid effect of the fertilizers.

Late pruning. L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 17, pp. 517, 518).—Data secured in an examination, subsequent to the severe spring frosts of the past season, of the experimental vineyard at Montpellier in which various rows had been pruned at different times of the year appear to confirm the author's conclusions (E. S. R., 27, p. 540) that pruning after the terminal shoots have started serves as a partial protection against spring frosts and increases production without materially affecting the vigor of the vine.

Experience on the reconstitution of vineyards with American stocks. E. PANTANELLI (*Staz. Sper. Agr. Ital.*, 45 (1912), No. 10, pp. 753-807).—A review of the literature of the subject, with special reference to investigations of the adaptability of various American stocks in Italian vineyards.

The Muscadine grapes. G. C. HUSMANN and C. DEARING (*U. S. Dept. Agr., Bur. Plant Indus. Bul.* 273, pp. 64, pls. 11, figs. 26).—This bulletin comprises as a whole a report of the viticultural investigations of the Bureau of Plant Industry in the Muscadine regions from 1905 to 1911. It discusses the present status of the Muscadine grape industry, the cooperative experimental work in progress on the Pender Test Farm of the North Carolina Department of Agriculture, botanical relationship, classification, distribution, and propagation of Muscadines, soils, preparation of the land, planting, cultivation, fertilization, pruning and training, harvesting and handling, yields and returns, relation of wine making to the *Rotundifolia* grape industry, unfermented grape juice, other uses of Muscadine grapes, Brix readings and acid content of Muscadine grapes, and insects and diseases. The results to date of researches in self-fertility, sterility, and breeding are given and the important varieties of Muscadines are described.

In the experiments in testing the self-fertility of varieties, both *Rotundifolia* and *Munsoniana* varieties have been included. Varieties of the latter species have been found to set naturally a higher percentage of fruit than those of the former. All tests so far made show that the Scuppernong, James, Thomas, Flowers, Mish, Eden, Memory, and Hopkins varieties are practically incapable of fertilizing themselves or each other. Natural pollination is found to be influenced by weather conditions, the proximity of male vines, and the presence of insects, especially a small bee-like fly and a small long-horned beetle (*Copidita thoracica*). It is recommended that provision be made in large Muscadine vineyards to protect the wild male vines growing in nearby woods and fence corners, either by planting them in or around the vineyard or by grafting the male scions into the tops of a number of the fruiting vines. In this connection, however, it has also been found that the congeniality of fertile pollen varies with different varieties and that there is a great variation among male vines relative to size of bloom cluster, date of blooming, length of blooming period, and profuseness of bloom. Care should be taken to select only those male vines that bloom at the same time as the vines they are intended to pollinate. The yield may be materially increased both by artificial hand cross-pollination in bags and by the daily hand pollinating of unbagged blossoms. Two Muscadine vines with perfect flowers have been grown from seed. They appear to be self-fertile and other varieties have been successfully fertilized with each of them.

Coffee manuring on a scientific basis, P. M. WILKINS (*Planters' Chron.*, 8 (1913), No. 18, pp. 208, 209).—Data are given showing the successful results obtained from 3 years' cultivation and systematic manuring of coffee on a private estate.

Flower gardening, H. S. ADAMS (*New York*, 1913, pp. 253, pls. 32, figs. 3).—A popular treatise on garden making and designing, including selections of varieties for various purposes.

Rogues in sweet peas, C. C. HURST (*Sweet Pea Ann.*, 1913, pp. 21–38, pl. 1).—A report of the nature of various rogues appearing in Spencer sweet peas, noted from another source (*E. S. R.*, 28, p. 238).

FORESTRY.

Second annual report of the state forester, W. T. COX (*Ann. Rpt. State Forester Minn.*, 2 (1912), pp. 61, pls. 2, figs. 20).—This comprises the report of the Minnesota state forester for 1912, the successive chapters of which deal with forest development, fire prevention, improvement work, slash disposal, educational work, reconnoissance survey, tree planting, state forests and parks, and recommendations. The forester's report is preceded by the second annual report of the proceedings of the Minnesota State Forestry Board. A synopsis of recent laws of different States relating to forests and forest fires is appended.

What Michigan is now doing in regard to forest fire protection, W. R. OATES, J. H. MCGILLIVRAY ET AL. (*Ann. Forestry Rpt., Game, Fish, and Forestry Dept. Mich.*, 1912, pp. 111, pls. 27).—A report is given of the progress made in the prevention of forest fires in Michigan, in which special reference is made to the enlistment of boy scouts and cooperative work with Michigan railroads in the prevention of forest fires. A classified record of forest fires in 1911–12 is appended.

Report of the superintendent of forestry, R. S. HOSMER ([*Bien.*] *Rpt. Bd. Comrs. Agr. and Forestry Hawaii*, 1911–12, pp. 49–81, pls. 9).—This comprises a report for the biennial period ended December 31, 1912, relative to the administration and management of Hawaiian forest reserves, tree planting operations by the government, corporations, and individuals, and miscellaneous forestry work.

Four new reserves have been added during the last biennial period (*E. S. R.*, 25, p. 242), making a total of 27 forest reserves with a total area of 683,101 acres. Of this amount 67 per cent is land belonging to the Territory.

Report of the forest nurseryman, D. HAUGHS ([*Bien.*] *Rpt. Bd. Comrs. Agr. and Forestry Hawaii*, 1911–12, pp. 82–89, pls. 3).—This comprises a progress report of the work done during the biennial period ended December 31, 1912, at the Government Nursery, Makiki Station, and Tantalus Forest.

Report of the consulting botanist, J. F. ROCK ([*Bien.*] *Rpt. Bd. Comrs. Agr. and Forestry Hawaii*, 1911–12, pp. 95–99, pls. 3).—A progress report on botanical explorations in the Hawaiian Islands (*E. S. R.*, 25, p. 242).

Progress report of forest administration in Coorg for 1911–12, H. TREMAN (*Rpt. Forest Admin. Coorg*, 1911–12, pp. 3+10+12).—A statistical review of the administration and management of the state forests in Coorg, including a financial statement for the year. All of the important data relative to alterations in forest areas, forest surveys, working plans, major and minor forest products, revenues, expenditures, etc., are appended in tabular form.

A statistical review of the forest administration of the Grand Duchy of Baden for the year 1911 (*Statist. Nachw. Forstverw. Baden*, 34 (1911), pp. XXII+155, figs. 11).—This is the customary statistical report on the adminis-

tration, management, and exploitation of the crown, community, and corporation forests of the Grand Duchy of Baden during 1911. Data are given on forest areas, various operations in the forests, yields in major and minor forest products, and financial returns. Comparative data are also given showing the net returns from the crown forests for each of the previous 44 years.

On the relation between forests and ground water, G. TRABUCCO (*Atti. R. Accad. Econ. Agr. Georg. Firenze*, 5. ser., 10 (1913), No. 2, pp. 147-172).—A review of the literature of the subject with special reference to Italian conditions.

The true selection system, F. F. R. CHANNER (*Indian Forester*, 39 (1913), No. 5, pp. 213-217).—An exposition relative to the adoption of transformation fellings for the conversion of irregular forests into selection forests, with special reference to Sál forests.

Anatomical investigations upon Japanese and other related coniferous seeds, M. KONDO (*Landw. Vers. Stat.*, 81 (1913), No. 3-6, pp. 443-468, pls. 3).—A study of seed and seedling structure in the Japanese conifers, including also a study of several related forms for the sake of comparison.

A contribution to the methods of regenerating pine stands, SCHWAPPACH (*Ztschr. Forst u. Jagdw.*, 45 (1913), No. 4, pp. 211-219).—An account of regeneration methods practiced in various pine stands, with special reference to the suitability of the selection-strip method of cutting for pine.

Influence of early thinning on regular stands of spruce, E. MER (*Bul. Soc. Agr. France*, 1913, May 15, Sup., pp. 641-647).—A record is given of an experimental spruce stand which was under observation during the period 1886 to 1907 to show the beneficial influence of early thinnings on the resulting stand of timber.

Norway spruce during the summer of 1911, E. MAIRE (*Rev. Eaux et Forêts*, 52 (1913), No. 4, pp. 97-108, figs. 3).—This comprises observations with data on the formation of fissures in the trees of various stands of Norway spruce in Normandy. The fissures occurred exclusively on very vigorous trees which were usually dominant in the stand, and they appeared to have developed during a period of great heat and drought during the latter part of July.

Wood-using industries of New Hampshire, R. E. SIMMONS (*Concord, N. H.: State Forestry Com.*, 1912, pp. 111, pls. 14).—This is a statistical study of the various industries of New Hampshire which utilize lumber after it has left the saw-mill, conducted cooperatively by the Forest Service of the U. S. Department of Agriculture and the Forestry Commission of New Hampshire. The data given show the kinds and quantity of local woods and of woods from other regions used in the various industries, the use which is made of each kind of wood, and the properties of the woods which especially fit them for various uses. A list of New Hampshire wood-using manufacturers is also appended.

The lumber estimator, J. M. LEAVER (*Sault Ste. Marie, Mich.*, 1911, pp. 112).—This comprises tables for the rapid estimation of board and surface measure contents of fractional sizes of lumber.

Note on the treatment of sleepers at Pyinmana by the forest economist in January, 1913, R. S. PEARSON (*Indian Forester*, 39 (1913), No. 5, pp. 217-225).—Experimental treatments of railway sleepers with chlorid of zinc and with green oil are reported.

Preliminary notes on tapping experiments at Kuala Lumpur, F. G. SPRING (*Agr. Bul. Fed. Malay States*, 1 (1913), No. 9, pp. 323-326).—A comparative test of various systems of tapping rubber is reported, with results thus far in favor of the V-shaped or half herringbone system.

Tapping experiments with *Hevea brasiliensis* with special reference to latex production, bark renewal, and the effect on the reserve material in the tree, S. V. SIMON (*Tropenpflanzer*, 17 (1913), Nos. 2, pp. 63-82; 3, pp. 119-

131: 4, pp. 181-191, figs. 12).—In these experiments special attention was paid to a comparison of the pricker system of tapping with various systems of knife tapping.

The author found that the pricker system does not yield a greater quantity of latex than knife tapping and that where the pricker system is used bark renewal is usually retarded and irregular. The renewal of the latex system in the tapping area is interfered with. In knife tapped trees the renewal of the bark is much more rapid, and there appears to be little danger of exhausting the reserve material providing the trees are growing sufficiently far apart to allow the crown of the trees to develop freely. As a further precaution against exhaustion of the reserve material, it is advised that the trees should not be tapped at times during the year when there are no appreciable assimilation activities, as during the yellowing and falling of the leaves, during the dormant period, and in the first days of leaf renewal.

Report of the superintendent of the rubber substation, W. A. ANDERSON (*Hawaii Sta. Rpt. 1912, pp. 88-91*).—Attention has been directed during the year chiefly toward the development of a system of tapping Ceara trees that would yield the largest amount of rubber per unit of labor without injury to the tree, and in curing the product in such a way as to make it satisfactory to manufacturers.

No satisfactory incision method for tapping the Ceara tree without removing the outer bark has thus far been found. The pricker method of tapping was found to be inferior to knife incisions, both as to yield and in recovering the flow of latex at subsequent tapplings. Two fundamental facts were demonstrated with reference to knife incisions: First, that a horizontal knife incision gives better results than a vertical incision; second, that the portion of the tree just above the ground to a height of about 6 in. yields rubber in much larger quantities than any other portion. The second of these facts was utilized in the development of a system here described, which has given better results in proportion to the labor involved than any other. By this method the bark is removed to a height of about 6 in. and cuts made with a very thin knife blade from the ground to the top of this stripped surface. The latex is allowed to flow to the ground and coagulate, the rubber being collected the following day and new cuts made at the same time. The average daily yield for 100 acres during 6 months' tapping was somewhat less than 4 lbs. Attempts to continue this method higher up on the tree have not thus far proved successful, and tests were started with another system of tapping here described.

It is concluded from the work so far done that the above system is the cheapest and most desirable where there are sufficient trees to be tapped to furnish work for all the labor available. The product, though very unattractive as it comes from the field, can when properly washed and vacuum dried be turned into rubber of the first class without too great expense.

[Analyses of Hawaiian rubber], W. McGEORGE (*Hawaii Sta. Rpt. 1912, pp. 62, 63*).—Comparative analyses of Hawaiian (Ceara) crepe and biscuit rubber and Malay crepe rubber are here reported. The Hawaiian rubber contains a somewhat higher percentage of ash and resins than the Malay rubber, the resin increase probably being due to a difference in the age of the trees.

Wild lettuce rubber, C. P. FOX (*Jour. Indus. and Engin. Chem., 5 (1913), No. 6, pp. 477, 478*).—A study of the chemical composition of 2 species of wild lettuce, *Lactuca canadensis* and *L. scariola*, with special reference to their possibilities as rubber producers.

L. canadensis was found to contain 2.19 per cent and *L. scariola* 1.58 per cent of a good quality of rubber. Both species also contained about 12 per cent of a waxy acetone soluble body. *L. canadensis* contained a bitter prin-

ciple which has been pronounced equal to lactucarium of German origin. As lactucarium is a recognized drug of the Pharmacopœia, the author suggests the possibility of combining the production of lactucarium and rubber in the North Temperate Zone.

DISEASES OF PLANTS.

Report of the Dominion botanist, H. T. GÜSSOW (*Canada Expt. Farms Rpts. 1912, pp. 193-201, 212-215, pls. 2, figs. 4*).—Miscellaneous investigations are reported upon, among them studies on the effect upon vegetation of water treated with hypochlorite of lime used against typhoid fever, some diseases of cereals, further observations on frosted wheat, and diseases of potatoes and other root crops, and of apples, small fruits, and ornamentals.

The results of the experiment on the effect of water containing hypochlorite of lime showed that it was without injurious effect when applied directly or indirectly to cultivated plants.

In connection with some of the potato diseases, particularly the *Rhizoctonia* disease, due to *Corticium vagum solani*, experiments in treating the tubers with formaldehyde and corrosive sublimate solutions showed that formalin was almost without effect, while the potatoes grown from tubers treated with corrosive sublimate were practically clean. In connection with the treatment of potatoes with corrosive sublimate, cooperative investigations were carried on with the chemist of the station to determine the amount of mercuric bichlorid absorbed, and it was found that in 3 lbs. of treated potatoes 0.05 gm. of mercuric bichlorid was present. In the author's opinion it is thought that this amount might prove injurious and, as a consequence, that potatoes intended for consumption should not be treated with corrosive sublimate.

Notes are given on experiments on the vegetation of Sable Island, and on the botanic gardens and the herbarium for seed collection.

Report of plant pathologist, H. E. STEVENS (*Florida Sta. Rpt. 1912, pp. XCIII-XCVIII*).—The author describes experiments on melanose of orange, citrus scab, and late blight of the Irish potato.

The investigations have shown that melanose is due to the same fungus as that causing stem-end rot (E. S. R., 28, p. 651). Infection experiments have produced the disease, which is found to be influenced by moisture and succulence of tissues.

The investigation of citrus scab has been more fully described elsewhere (E. S. R., 27, p. 653).

A serious outbreak of late blight of potatoes was called to the author's attention. Spraying with Bordeaux mixture was recommended, and where the spraying was well done favorable results were obtained.

Report of assistant plant pathologist, O. F. BURGER (*Florida Sta. Rpt. 1912, pp. XCVIII-CI*).—Descriptions are given of a bacterial disease of lettuce and a new cucumber disease that is apparently of bacterial origin.

The lettuce disease was originally described by the former pathologist (E. S. R., 21, p. 342). The behavior of the organism in various media is given and suggestions are offered for treatment, which consists of the removal from the field of all diseased plants and their destruction by burning, together with directions for the care of the plants in the seed bed.

The cucumber disease is said to have been troublesome for the past 2 years, attacking leaves and fruit. An organism was isolated from the fruit and inoculation experiments demonstrated its pathogenic properties. The disease is said to be spreading over the entire cucumber-growing district of Florida, and in some places 50 per cent of the crop was destroyed during the year

covered by the report. The only suggestion regarding treatment is the removal of all infected plants and fruits from the field.

Report of the division of vegetable pathology, May–December, 1911, R. AVERNA-SACCÁ (Bul. Agr. [São Paulo], 13. ser., 1912, No. 3, pp. 208–247, figs. 6).—This report includes besides other matters brief notices of plant diseases observed, their characters, causes, and recommended protective measures. Among these diseases may be mentioned anthracnose (*Colletotrichum glaucosporiodes*), mummification (*Botrytis citricola*), rot (*Pythiacystis citricola*), gummosis (*Bacterium gummi*), and chlorosis of lemons; *Botrytis anona* on Anona; bacteriosis (*Bacterium mori*) and chlorosis of mulberry; mummification (*Gnomonia psidii*), and rust (*Puccinia psidii*) of guava; *Scolecotrichum caricae* and *Oidium caricae* on Ricinus; *Rhizoctonia violacea* and *Erysiphe communis* on alfalfa; *Peronospora viciae* on vetch; *Sclerotinia libertiana* on legumes; *Tylenchus tritici*, *Tilletia larvis*, *Ophiobolus herpotrichus*, and *O. graminis* on wheat; *Micrococcus tritici* on wheat and rice; *Chrysophygdia endobiotica* on potato; and *Plasmopara cubensis* on cucurbits. A list of contributions on plant diseases by the same author is appended.

• **Parasitic wilt diseases of cultivated plants due to fungi, H. W. WOLLENWEBER (Ber. Deut. Bot. Gesell., 31 (1913), No. 1, pp. 17–34).**—The author reports that he has found these fungi as vascular parasites causing wilt diseases of the following plants: *Fusarium vasinfectum* on *Gossypium herbaceum* and *G. barbadense*; *F. tracheiphilum* (also causing a foot disease) on *Vigna sinensis*; *F. lycopersici* (causing also a fruit spot) on *Solanum lycopersicum*; *F. niveum* on *Citrullus vulgaris*; and *Verticillium albo-atrum* on *S. tuberosum*, *S. melongena*, and *Hibiscus esculentus*. *Sclerotium rolfsii* is stated to cause a foot disease on *S. melongena*, also *F. redolens* n. sp. and *F. sclerotium* n. sp. are claimed to cause foot disease on *Pisum sativum* and *S. lycopersicum*, respectively. Soil is said to be a predisposing factor in the production of wilt, especially when the admixture of sand is considerable. It is thought that bacteria also cause wilt diseases, but that most wilt diseases are due to *Fusarium* in the warm regions and a smaller number to *Verticillium* in colder climates.

On the causes which determine infertility of the soil and loss of crops, A. JACHEVSKI (Khozjaistvo, 7 (1912), No. 34, pp. 1103–1108; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 11, pp. 2528–2531).—The author, stating that soil fatigue is frequently attributed to wrong causes, cites cases observed where the effects were due to fungi, as *Fusarium lini*, *F. secalis*, *Helminthosporium gramineum*, *Cladosporium herbarum*, *Sclerotinia trifoliorum*, and *S. libertiana*. The last of these is said to have adapted itself to different substrata, so that rotation gave unsatisfactory results in many cases. The use of formalin or copper sulphate on the seeds, burning of stubble, and disinfection of the ground with formalin, kerosene, or carbon bisulphid is recommended.

Infection studies with red fruited mistletoe (*Viscum cruciatum*), C. von TUEBEUF (Naturw. Ztschr. Forst u. Landw., 11 (1913), No. 3, pp. 151–166, figs. 12).—Continuing previous work (E. S. R., 20, p. 930; 22, p. 722) with infection as related to the question of races, the author states that he has succeeded in producing infection with greater or less subsequent development in case of *Olea europaea*, *Crataegus oxyacantha*, *Fraxinus cinerea*, *Syringa vulgaris*, *Prunus padus*, *Pyrus malus*, *P. communis*, *Populus nigra*, *Salix caprea*, *Cytisus laburnum*, *Sorbus aucuparia*, and *Viscum album*. It was found also that the pollen of *V. cruciatum* was capable of fertilizing the white species.

Sterilization of seeds, PINOY and MAGROU (Bul. Soc. Bot. France, 59 (1912), No. 7, pp. 609–612).—The authors report that various leguminous and other

seeds kept in oxygenated water for 5 hours or more showed from 90 to 100 per cent sterilization as regards fungi and bacteria without impairment of the germinating power. In some cases germination was even accelerated.

Infection of grain by *Fusarium* and its significance in regard to grain breeding and values, SCHAFFNIT (*Centbl. Bakt. [etc.]*, 2. Abt., 37 (1913), No. 1-3, pp. 53, 54).—The author states that infection takes place while the grain is developing. Primary infection depends upon definite relations, such as structure of the husk favorable to water entrance, water content of the grain (not less than 35 per cent), and humidity of the atmosphere (80 to 100 per cent), conditions fulfilled in times of rains when spores are carried by capillarity with water into the spaces between grain and glumes, the grain so attacked being light and imperfect. Secondary infection occurs just before or during harvest, the grain in this case being of full weight and size but showing red or brown coloration. The results of primary infection show in the seedling. It is deemed possible by selection and disinfection of seed grain to lessen materially the loss from *Fusarium* attack.

Snow mold, E. VOGES (*Deut. Landw. Presse*, 40 (1913), No. 19, pp. 229-231, figs. 3).—The author states that this disease, attributed to *Fusarium nivale*, although it is claimed by Schaffnit (*E. S. R.*, 29, p. 47) that this is only one of several fungi causing the trouble, was found not only in early spring but also in October on grain which had been severely attacked in summer by stalk disease (*E. S. R.*, 28, p. 445). As a result of experiments briefly discussed, he inclines to the view that *F. nivale* is really identical with some of the numerous fungi which persist during the entire year on grains and grasses, possibly with *Ophiobolus herpotrichus*. Dryness of the air and vigor in the plant seem to aid resistance to attack of the fungus. Top-dressing with nitrate of soda is recommended to stimulate vigor.

A disease of cereals in Russia, T. VASSILIEV (*Khozjaistvo*, 7 (1912), Nos. 26, pp. 864-872; 27, pp. 903-909; abs. in *Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 10, pp. 2301-2303).—As the result of a detailed study of the disease called zapal or zakvat, causing enormous losses annually in southeast Russia, the author concludes that the cause of this trouble is to be found exclusively in such factors as high temperature, dryness, excessive insolation, dust fogs, etc.; and that severe attacks by insects or fungus diseases are not the cause but the effect of zapal which renders the plants less resistant. Nothing has been done to control the evil, which seems to require further investigation and perhaps extended statistical study.

Smut experiments at the state farm, Bungewonggorai, R. E. SOUTTER (*Queensland Agr. Jour.*, 30 (1913), No. 3, pp. 162, 163).—These experiments, carried out in 1912 to test the value of several fungicides in reducing reinfection in treated grain which has been exposed to infection by untreated drills or bags used for smutted wheat, are said to show a high value of arsenic as a treatment for this purpose, the increase of smut by reinfection being only 3 per cent. The experiments are to be continued next season.

Combating grain smuts, L. MÜLLER (*Hess. Landw. Ztschr.*, 1912, pp. 646-649; abs. in *Mycol. Centbl.*, 2 (1913), No. 4, p. 225).—The author summarizes the methods and means known at the present time for the control of grain smuts.

A hybrid wheat resistant to rust, C. GÉNIN (*Jour. Agr. Prat.*, n. ser., 24 (1912), No. 36, pp. 301-303, figs. 2; abs. in *Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 11, pp. 2531, 2532).—The author claims to have obtained by crossing Rieti with Japhet a beardless wheat with a full long grain, adapted to southeast France, and maturing early enough to escape the rust.

Cucumber wilt, J. HANZAWA (*Ztschr. Pflanzenkrank.*, 23 (1913), No. 2, pp. 65-72, pls. 2, figs. 3).—The author describes a wilt of cucumbers which recently appeared in a greenhouse at Sapporo, Japan. Among the fungi found in this connection one was noted which was thought to be new and to cause the disease. This is described as *Nectriella cucumeris* n. sp.

Onion smut, D. REDDICK (*West. N. Y. Hort. Soc. Proc.*, 58 (1912), pp. 194-197, fig. 1).—This disease (*Urocystis cepulae*), attacking the leaves and bulb, is said to infect the onion when in the seedling stage, never after it is 3 in. high. The exact method of infection is not yet certain. It is thought that the very abundant spores may be carried on the seeds and may retain vitality in the ground for 25 years, producing infection under favorable conditions of heat and moisture; also that the hairlike tube resulting may branch and bear secondary spores, increasing the possibilities of infection.

Of the several methods of control proposed, rotation is not regarded as very practical. Onions grown from sets and transplants are said not to be subject to the disease. Treating the seeds with formalin is suggested, and a drip attachment for the seed drill, sterilizing the soil in the immediate vicinity of the seed by means of formalin, has been found helpful. Sulphur and air-slaked lime, 100 lbs. and 50 lbs. per acre, respectively, used together, are recommended as useful, if applied in drills with a special attachment, but not perfect as regards control. Further experimentation is in progress.

Disease of rice and of onions, R. RAMIREZ (*Bol. Dir. Gen. Agr. [Mexico]*, *Rev. Agr.*, 2 (1912), No. 5, pp. 413-415, pls. 2).—A smut of rice ascribed to *Pleospora herbarum* and a spot disease of onions ascribed to *Macrosporium sarcinula* are figured and briefly described. The author recommends in case of the former, disinfection of the seed with formalin; for the latter, application of lime-sulphur solution in the strength of 1:1:100.

A preliminary note on a new bacterial disease of *Pisum sativum*, DOROTHY M. CAYLEY (*Proc. Roy. Soc. [London]*, *Ser. B*, 86 (1913), No. 586, pp. 171-173; noted in *Gard. Chron.*, 3, ser., 53 (1913), No. 1362, p. 74).—The author gives an account of studies on a serious disease affecting garden peas, killing a large proportion of the crop in the neighborhood of Merton, Surrey.

The disease is ascribed to a very large rod-shaped bacillus transmitted in the interior of the seeds, which has been isolated from the stem of the living plant and from the center of the cotyledons. The life history is said to be complicated by involution forms and a zoogloëal stage. The biology and symptoms are discussed. In very bad cases little or no germination takes place. It is thought that the bacillus passes up through the plant tissues, infecting the young seed, those of a given pod all being diseased to an equal extent. This disease is spread chiefly through the seed, but fresh infection may take place through the soil. Results tend to show that the bacillus can penetrate only very young tissue.

It is said that in many respects the symptoms resemble those of streak disease of *Lathyrus odoratus*. This disease has been claimed to be due to *Thielaria basicola*, but the author states that she has already found bacteria like those here described in stems of diseased sweet peas.

Further investigations are in progress.

Cystopus candidus on broad leaved pepperwort (*Lepidium latifolium*), E. NOFFRAY (*Jour. Agr. Prat.*, n. ser., 24 (1912), No. 31, pp. 147, 148; abs. in *Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 10, p. 2366).—The author calls attention to the facts that *L. latifolium*, occasionally found growing around dwellings in considerable abundance, is attacked by *C. candidus*, and forms a source of infection by this fungus for cultivated crucifers.

Field studies of a leaf-roll disease of potatoes, C. I. FITCH (*Proc. Soc. Hort. Sci.*, 9 (1912), pp. 44-51).—According to the author, in 1911 potatoes in South Dakota, Nebraska, Wyoming, Colorado, and New Mexico were affected by a disease the most characteristic symptom of which was the rolling of the leaflets upward. The purpose of the paper is to present the field conditions and history of the disease and to call attention to its resemblance to the leaf-roll disease of Germany and Austria. In the discussion following the presentation of the paper, W. A. Orton, of this Department, confirmed the occurrence in this country of the true leaf roll that has prevailed in Germany since 1905.

Noteworthy communications regarding sugar beet diseases appearing in 1912, A. STIFT (*Centbl. Bakt. [etc.]*, 2. Abt., 37 (1913), No. 1-3, pp. 34-53).—This is a digest of numerous investigations on sugar beet diseases published during the past year.

Vegetable parasites of tomato, E. FINARDI (*Avven. Agr.*, 20 (1912), No. 7, pp. 290-292; *abs. in Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 10, p. 2310).—The author reports that the tomato crops in the Province of Parma have been severely attacked by various diseases, among the most widespread of which are bacteriosis (*Bacterium briovii*), potato disease (*Phytophthora infestans*), and *Septoria lycopersici*. Descriptions of the diseases and of appropriate methods of control are given.

A rot of tomato caused by *Phytobacter lycopersicum* n. sp., J. GROENEWEGE (*Meded. Rijks Hoogere Land, Tuin en Boschbouwsch. [Wageningen]*, 5 (1912), No. 5, pp. 217-239, pls. 5; *Centbl. Bakt. [etc.]*, 2. Abt., 37 (1913), No. 1-3, pp. 16-31, pl. 1).—The author gives an account of a tomato rot causing considerable damage recently in parts of Holland, ascribed to the activity of an organism found in connection therewith and described as *P. lycopersicum*.

It is thought to be an obligate aerobic and wound parasite, infecting the fruits from soil long planted in tomatoes, as evidenced by the facts that the lower fruits were often first attacked and that deep turning or removal and renewal of the top soil rendered plants so treated again suitable for tomatoes. The disease is said to be favored by excessive moisture and hindered by ventilation and drying. It has been suggested that the disease may at least in part be carried by insects attacking the fruit. Artificial inoculation of leaves and stems showed no results.

Details are given of physiological studies made. A degree of variability has been observed, the possibility of the connection of which with physiological conditions is discussed, as is also its probable relation with other organisms.

Natural resistance to disease in fruits, U. P. HEDRICK (*Proc. Soc. Hort. Sci.*, 9 (1912), pp. 106-114).—Lists are given of varieties of apples, pears, peaches, plums, and cherries which are relatively immune or susceptible in New York to some of the more important diseases to which these fruits are subject.

Bitter pit in apples (*Jour. New Zeal. Dept. Agr.*, 5 (1912), No. 2, p. 139; *Jour. Dept. Agr. So. Aust.*, 16 (1913), No. 6, pp. 667-672; *Fruit World Austral.*, 14 (1913), No. 2, p. 49).—This is a summary of the first progress report on bitter pit investigations carried on since August, 1911, and still in progress by D. McAlpine.

It is claimed that the trouble is not due to an organism. The spots, which are more common on the more actively transpiring, drier calyx-end half of the apple, are usually present subcutaneously before maturity of the fruit as regions of dry shrunken tissue, usually marked outwardly by the pits. The rotting of such fruit is also characteristic and the pitting may be associated with black spot or scab, bitter rot, glassy or watery core, or moldy core, or the trees or fruit may be perfectly healthy otherwise. The disease is more common on apples than on pears or quinces and on some varieties more than

others, Cleopatra suffering most of all varieties and Yates least. The disease has been known in Australia since 1886. It is worse on a light crop of large fruit or in case of trees severely pruned, and in wet seasons. It appears to be favored by intermittent weather conditions, sudden checking of transpiration at night, inequality of growth (interfering with the development of the vascular network controlling the distribution of the nutritive material), intermittent stimulation during growth of the fruit, late gathering of the fruit, and fluctuations of temperature and humidity when in store or transit.

It is thought that moderate pruning, admitting light at the top, and grafting new varieties will prove beneficial. Cool storage was followed by excellent results, as apples kept at 34° F. for four months showed no sign of bitter pit. It is said, however, that when the temperature falls below the point where respiration ceases, danger results. Apparently the most satisfactory temperatures are those between 31 and 34°. It is found necessary also to keep the carbon dioxid drawn off and to provide for free circulation of air through the cases.

Apple scab situation, D. REDDICK (*West. N. Y. Hort. Soc. Proc.*, 58 (1912), pp. 86-90).—It is held that the slight damage from apple scab in 1911 was due to the fact that the showers were of short duration, sufficient to cause a discharge of spores from the winter fruit bodies of the fungus but not prolonged enough to hold the moisture necessary for spore germination, and to the fact that high winds shook the drops from the leaves and quickly dried the surfaces. The resulting small number of infected leaves left over during the winter is believed to account for the low rate of infection in 1912. The usual vigilance however is recommended, as comparatively little infection is apt with favorable rains to result in severe injury to the apple crop.

Trichoseptoria fructigena, a disease of quinces and apples new in Germany, W. PIETSCH (*Ber. Deut. Bot. Gesell.*, 31 (1913), No. 1, pp. 12-14).—The author claims to have found that *T. fructigena*, previously shown by Maublanc (E. S. R., 26, p. 449) to attack apples, has a somewhat wide distribution, but that the fruit of *Cydonia vulgaris* is its principal substratum. *C. japonica* appears to be immune to this fungus.

A momentous discovery for fruit growers, E. WALKER (*Country Life* [London], 33 (1913), No. 852, pp. 644, 645).—The author reports the presence of a disease of pears which results in the discoloration and blackening of the flowers and foliage and which is apparently the same as the bacterial or fire blight of pears. In addition it is stated that the bacteria accompanying the disease have been found in nurseries and plantations on apples and plums.

Report of former plant pathologist, H. S. FAWCETT (*Florida Sta. Rpt.* 1912, pp. LXIV-LXXIII, LXXVII-XCII).—The author gives a detailed account of cultural, infection, and control work with the fungus *Phomopsis citri*, the cause of stem-end rot, which has previously been partially reported upon (E. S. R., 26, p. 449; 28, p. 549). Spraying tests are noted on page 248.

An account is given of an experiment conducted to determine the cause of gumming or gummosis. Two different forms of gumming were found, one of which has been described as due to *Diplodia natalensis* (E. S. R., 27, p. 350). Inoculation experiments were made with *P. citri*, *Colletotrichum gloeosporioides*, *Sphacopsis tumefaciens*, *Alternaria citri*, and *Alternaria* sp. isolated from leaves, and *Cladosporium herbarum*, *S. malorum*, and *Fusarium gramineum* from other sources. Of these, *P. citri* induced gumming, which was about half as copious as that due to *Diplodia*. The *Fusarium* produced still less, and *A. citri* and *Colletotrichum gloeosporioides* induced only slight amounts of gum. The other species had no effect in this respect. Experiments were made with bacteria from various sources, but none of the bacteria produced gumming when

inserted into cuts. The possibility of the action of enzymes in relation to this disease was investigated, but so far as the investigations went no gumming resulted. A detailed tabulated account is given of the results of inoculation experiments with *Diplodia* on a large number of trees.

Report of plant physiologist, B. F. FLOYD (*Florida Sta. Rpt. 1912, pp. CII-CXIV, figs. 7*).—The work reported upon is largely that on die-back of citrus trees when grown under greenhouse conditions. The results of the investigations indicate that the production of the die-back condition is connected with the organic nitrogenous fertilizers. Instances were found, however, where die-back occurred where no fertilizers had been used, and it is concluded that in this case the casual factor is connected with the organic matter in the soil.

In connection with the foregoing investigation, a study was made of the gum pockets produced by die-back in citrus wood, and it appears that the gum pockets are possibly a result of the action of enzymes. The enzymes suggested are pectinase and hemicellulase, and the presence of at least one of these was demonstrated.

Experiments on the decay of Florida oranges, J. G. GROSSENEACHER (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 124, pp. 17-28, figs. 3*).—According to the author, oranges in Florida suffered severely during 1912 from decay, and the present paper calls attention to the weather conditions, diseases, and injuries sustained by the fruit in the groves, and the relation of these factors to decay.

Oranges affected with melanose and ammoniation seemed to be especially subject to the rot and an investigation was conducted to determine their relation to the trouble. In a previous publication (*E. S. R., 28, p. 651*) Floyd and Stevens had called attention to the relation of melanose to stem-end rot. The author reports upon this briefly and calls attention to the fact that ordinarily the fungus (*Phomopsis citri*) is not to be found in the melanose roughenings on the leaves, shoots, or fruits. However, in certain unusually shaped spots, termed stellate spots, the fungus has been found present, though not often.

Some experiments were carried on to determine the cause of decay, particularly in view of the fact that growers and shippers attribute most of the loss to *Penicillium*. Oranges were sprayed both in Florida and in Washington, D. C., with spores of *Penicillium*, and it was found that while there was some blue mold decay, most of it was due to *Phomopsis citri*.

The author points out the importance of growing fruit free from melanose and thus obviating a reduction in the market value of the fruit and also preventing some splits and most of the stem-end rot, and that refrigeration practically prevented all decay in shipping tests conducted with this fruit.

Black rot of the navel orange, E. O. AMUNDSEN (*Mo. Bul. Com. Hort. Cal., 2 (1913), No. 5, pp. 527-534, figs. 5*).—The author states that the navel orange crop in California for a number of years has been affected by a disease variously known as black rot, navel rot, and black heart of the navel orange, due to the fungus *Alternaria citri*, which has been previously described (*E. S. R., 14, p. 459*). The characteristics of the disease and the results of inoculation experiments are described.

Investigations of cacao canker, A. A. L. RUTGERS (*Dept. Landb., Nijr. en Handel [Dutch East Indies], Meded. Afdeel. Plantenziekten, 1912, No. 1, pp. 31, pls. 3, fig. 1; abs. in Teysmannia, 24 (1913), No. 1, pp. 68, 69; Mycol. Centbl., 2 (1913), No. 4, pp. 223, 224*).—It is stated that *Phytophthora faberi* is the cause of cacao canker, and that it causes the brown rot of cacao fruits and a canker on *Hevea*; also that the damage to cacao plants in Java, where the brown rot is not so frequent, is less serious than in Trinidad and Ceylon. Investigations showed that *P. faberi* is very closely followed by *Nectria* (*Fusarium*), and in the fruits sometimes also by *Thyridaria* (*Diplodia*).

Preventive or remedial measures recommended include giving access of air and light by thinning and pruning both cacao and shade trees, collecting and destroying the diseased fruits, and spraying stems and branches with Bordeaux mixture. An extensive bibliography is appended.

Lime-sulphur wash for American gooseberry mildew (*Sphærotheca mors-uvæ*), E. S. SALMON and C. W. B. WRIGHT (*Jour. Rd. Agr. [London]*, 19 (1913), No. 12, pp. 994-1004).—As a result of experiments carried out during 1911 at Wye, Kent, and during 1912 in North Kent, the authors state that different varieties of gooseberries differ greatly as regards susceptibility to injury by lime-sulphur wash. Some, as May Duke, will under ordinary conditions bear repeated spraying throughout the season with the full strength (specific gravity 1.01) necessary to prevent attacks of American gooseberry mildew without injury to the foliage. Some, as Crown Bob, will bear half this strength early in the season, as in May and June, when spraying is most efficacious, but prove more susceptible to injury later. Others, as Berry Early, will bear half strength early in the season in shaded situations or cloudy weather. Still others, as Valentine Seedling and Yellow Rough, can not safely be sprayed with lime-sulphur wash.

Recent observations on downy mildew, J. CHRESTIAN (*Rev. Colons Afrique Nord*, 1912, No. 1, pp. 48-50, 73-76, 101-103, 140-143; *abs. in Mycol. Centbl.*, 2 (1913), No. 4, p. 223).—The author gives a résumé of the principal results recently obtained in a study of the development and biology of *Plasmopara viticola*, which is held to attack grape leaves only by way of the stomata of the lower surface. Experiments conducted during 1908 to 1911 are held to show that attacks of mildew always follow periods of high humidity and nearly stationary temperature. Some suggestions are made as to the manner of using copper fungicides to obtain the best practical results therefrom.

A disease of lilac (*Phytophthora syringæ*) new in Netherlands, T. A. C. SCHOEVERS (*Tijdschr. Plantenziekten*, 19 (1913), No. 2, pp. 41-64, pls. 2).—A description is given of a disease which has recently been shown to exist in parts of Holland, killing buds and twigs of several varieties of lilac. The source and relations of the fungus (*P. syringæ*) thought to cause the trouble are still under investigation. It is said that the usual fungicides afford but little protection, and that the principal measures that can be relied upon at present are removal and destruction of the parts affected.

Pine blister rust and currant felt rust, F. C. STEWART (*West. N. Y. Hort. Soc. Proc.*, 58 (1912), pp. 122-124).—The author gives a further discussion (E. S. R., 21, p. 644) of this disease, which is now said to be established in New York, Massachusetts, and Connecticut.

The aecidial stage of the fungus (*Cronartium ribicola*) is stated to infect only those pines which bear their leaves in clusters of five, specifically *Pinus strobus*, *P. cembra*, *P. lambertiana*, *P. monticola*, and possibly *P. excelsa*, proving very dangerous to the white pine, as it attacks both trunk and branches and eventually kills the trees. While pines can not infect one another, they can infect *Ribes*, nearly all wild and cultivated species of which are attacked by the alternate stage (particularly the relatively unimportant black currant) and are capable of spreading the infection rapidly from one to another for considerable distances, also to pines at shorter distances. On *Ribes* the disease is conspicuous, but on *Pinus* it may not show for a year or more after infection. Investigations are in progress to show whether or not this fungus can winter on *Ribes*.

It is thought that careful measures may control the disease to a great extent. The recommendation is made that *Ribes* and susceptible pines be sufficiently separated in cultivation; that no more black currants be planted, and that

any showing the disease be promptly destroyed; that the distribution of diseased pines be prevented; and that in case the disease is shown to winter on *Ribes*, the distribution of such plants showing disease be also prevented.

Physalospora latitans attacking *Eucalyptus rostrata*, R. AVERNA-SACCÁ (*Fazendeiro* [São Paulo], 5 (1912), No. 6, pp. 232-235; *abs. in Internat. Inst. Agr.* [Rome], *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 10, pp. 2310, 2311).—This fungus, observed by the author in 1911 and since, on *E. rostrata*, was not found to infect the other numerous species of cultivated *Eucalyptus* nearby. The disease is said to appear in July or August. It is stated that the leaves wither and fall prematurely if the petioles are attacked and that new branches almost always die, also that heat and moisture seem to promote the activity of the fungus.

It is claimed that proper application of Bordeaux mixture will control the disease on young plants, but that in case of older trees the infected branches and leaves should be removed and burned.

A *Fusicladium* disease of *Hevea*, J. KUIJPER (*Dept. Landb. Suriname Bul.* 28, 1912, pp. 3-10, pls. 2).—The substance of this has already been noted from another source (*E. S. R.*, 26, p. 651).

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The fauna of the Hawaiian Islands, edited by D. SHARP (*Fauna Hawaiianensis. Cambridge, England, vol. 1, 1899, pts. 1, pp. 122, pls. 3; 2, pp. 123-275, pls. 5; 1901, pt. 3, pp. 277-364, pls. 2; 1903, pt. 4, pp. 365-466; 1907, pt. 5, pp. 469-759, pls. 16; 1913, pt. 6, pp. CCXXVIII, pls. 16; vol. 2, 1899, pts 1, pp. 30, pls. 2; 2, pp. 31-89, pls. 3; 1900, pts. 3, pp. 91-270, pls. 5; 4, pp. 271-441, pls. 4; 5, pp. 443-530, pls. 7; 1910, pt. 6, pp. 531-700; vol. 3, 1901, pt. 1, pp. 77, pls. 3; 1902, pt. 2, pp. 79-174, pls. 2; 1903, pt. 3, pp. 175-292, pls. 2; 1904, pt. 4, pp. 293-366, pls. 5; 1908, pt. 5, pp. 367-579, pls. 4; 1910, pt. 6, pp. 581-704, pls. 3*).—Part 1 of volume 1 dealing with the aculeate Hymenoptera is by R. C. L. Perkins and A. Forel; part 2 with the Macrolepidoptera by E. Meyrick; part 3 with the parasitic Hymenoptera by W. H. Ashmead; part 4 with the Vertebrata, by R. C. L. Perkins; part 5 with the Microlepidoptera by Lord Walsingham; and part 6, which completes the volume, includes an introductory essay on the fauna by R. C. L. Perkins, title pages, and a combined index to the 3 volumes. Lists are also given of the contents of the 3 volumes systematically arranged, and arranged according to the authors' names.

Part 1 of volume 2 deals with the Orthoptera, and part 2 with the Neuroptera, both by R. C. L. Perkins. In part 3, which consists of the first and second papers on the Coleoptera, the Phytophaga are taken up by D. Sharp (pp. 91-116) and the Rhynchophora, Proterhinidae, Heteromera, and Cioidae by R. C. L. Perkins (pp. 117-270); in part 4, the Mollusca are taken up by E. R. Sykes (pp. 271-412), the earthworms by F. E. Deddard (pp. 413-426), and Entozoa by A. E. Shipley (pp. 427-441); in part 5 the Arachnida are taken up by E. Simon (pp. 443-519), the Isopoda by A. Dollfus (pp. 521-527) and the Amphipoda by T. R. R. Stebbing (pp. 527-530); part 6 includes supplements to the Hemiptera by G. W. Kirkaldy (pp. 531-599), and to the Hymenoptera (pp. 600-686), Orthoptera (pp. 687-690), Neuroptera (pp. 691-696), and Diptera (pp. 697-700) by R. C. L. Perkins.

Part 1 of volume 3 dealing with the Diptera is by P. H. Grimshaw; part 2 includes a supplement to the Diptera by P. H. Grimshaw and P. Speiser (pp. 79-92), and a paper on the Hemiptera by G. W. Kirkaldy (pp. 93-174); part 3, the third paper on the Coleoptera, dealing with the Caraboidea is by D. Sharp; part 4 includes papers on the Thysanura by F. Silvestri (pp. 293-297), the

Collembola by G. H. Carpenter (pp. 299-303), the Mallophaga from birds of the Hawaiian Islands by V. L. Kellogg and B. L. Chapman (pp. 305-321), the Myriopoda by F. Silvestri (pp. 332-338), a supplement to Arachnida by E. Simon (pp. 339-344), and a supplement to the Macrolepidoptera by E. Meyrick (pp. 345-366); part 5, which is a continuation of the paper on the Coleoptera, is by D. Sharp and H. Scott; and part 6 consists of the fourth paper on Coleoptera, by R. C. L. Perkins, H. Scott, and D. Sharp (pp. 581-606), the Strepsiptera by R. C. L. Perkins (p. 667), the Thysanoptera by R. S. Bagnall (pp. 669-701), and the Acarina by N. D. F. Pearce (pp. 702-704).

Report of entomologist, J. R. WATSON (*Florida Sta. Rpt. 1912, pp. XLVIII-LXIII, figs. 2*).—Investigations of the disease of the citrus white fly commonly known as "natural mortality" have shown it to be due to the Microcera or white fringe fungus, although this often does not develop sufficient growth of filaments to form the characteristic fringe. The condition spreads from centers of infection; it may be abundant on a few leaves of a small plant in the nursery row and nearly absent from other leaves on the same plant. On some leaves it may kill as high as 90 per cent or more of the larvæ but from 10 to 30 per cent is much more common.

Although some spraying experiments resulted in a conspicuous rise in the amount of "natural mortality," the increase over the amount in the check plats was not nearly so marked as has usually attended the introduction of the red Aschersonia or the brown fungus (*Egerita*). Particular weather conditions (damp and coolness) appear to be necessary for the rapid spread of the Microcera, as is also a more or less crowded condition of the larvæ on a leaf. Because of these facts it is probable that spraying this fungus alone into trees infested with white fly will not have as marked effects as in the case of the red or brown fungus.

Studies of the woolly white fly (*Aleyrodes howardii*) show it to have spread quite widely in citrus groves, having been recently introduced at Miami and possibly at Fort Myers. In most cases the infestation of this species is very slight as compared with that of *A. citri*. No parasitic fungi were found on the species during the winter, indicating that it is not as subject to fungus attack as is *A. citri*. It was heavily parasitized (74.4 per cent) by a chalcidid, and 21.6 per cent is said to have failed to emerge for some unknown reason, making less than 4 per cent that emerged. Observations on the status of the white fly and fungi in various groves of the State are reported.

Experiments indicate that the use of heat as a means of killing the white fly on citrus trees is impractical, at least during the actively growing season.

In spraying experiments with thrips (*Euthrips tritici*) on tomatoes 78 per cent were destroyed by a mixture consisting of commercial lime-sulphur $5\frac{1}{2}$ gal., blackleaf 40 14 fluid ounces, and water 200 gal.

Brief notes are presented upon the occurrence of several additional insect pests during the year. It is stated that the boll weevil reached Florida in the fall of 1911, specimens having been received from Escambia County.

Insect notes for 1912, O. A. JOHANNSEN (*Maine Sta. Bul. 207, pp. 431-466, pls. 3, figs. 9*).—Notes based upon the station's records for the year, including the occurrence of important insects, are here presented. Among the more important species considered are the European fruit scale, San José scale, rose scale, oyster-shell scale, scurfy scale, Lintner's scale (*Chionaspis lintneri*), European elm scale, maple phenacoccus (*Phenacoccus acericola*), *P. decarncssi*, European fruit lecanium (*Eulecanium corni*), and cottony maple scale, including a table for the separation of these scale insects, various plant lice, *Euranessa antiopa*, *Ctenucha virginica*, brown tail and gipsy moths, tent caterpillars, birch

leaf roller (*Peronia ferrugana*), alder flea beetle (*Haltica bimarginata*), wire-worms in corn (*Agriotes mancus*), elm borer, etc.

Notes are also presented on *Monodontomerus aereus* and *Pteromalus cgregius* as parasites of the brown-tail moth. A brief statement of a spray test for conifers is included.

The principal insects injurious to agriculture during 1911-12, M. H. SWENK (*Bul. State Ent. Nebr., 1913, No. 1, pp. 104, figs. 24*).—This report includes a discussion of the results of investigations carried on during the 2 years. The subject matter is dealt with under the headings of grasshoppers, blister beetles, corn cutworms, the variegated cutworm, the army worm, the fall army worm, the corn-ear worm as an alfalfa pest, webworms (*Loxostege sticticalis* and the garden webworm), the Hessian fly, the sorghum midge (*Contarinia sorghicola*), the wheat-stem maggot (*Meromyza americana*), the chinch bug, the false chinch bug (*Nysius angustatus*), the corn-root louse or aphid, the corn-leaf louse (*Aphis maidis*), wireworms (*McLanotus communis*), the northern corn-root worm (*Diabrotica longicornis*), the timothy billbug (*Sphenophorus parrulus*), the stalk borer (*Papaipema nitela*), the wheat-root aphids (*Forda occidentalis* and *Geocica squamosa*), white grubs in wheat (*Cyclocephala villosa*), purslane sawflies in the fall wheat (*Sterictiphora lineata*), thrips blasting alfalfa blossoms (*Thrips tabaci*), the clover-seed chalcid, a new leaf hopper (*Campylendria curvata*) in alfalfa fields, the clover-hay worm, the western cottony grass scale (*Eriopeltis coloradensis*), etc.

New destructive insects in New York, P. J. PARROTT (*Jour. Econ. Ent., 6 (1913), No. 1, pp. 61-66*).—This paper deals with the pear thrips, the cherry sawfly leaf miner (*Præfusa collaris*), *Polydrosus impressifrons* which seriously injured the young buds of grafts of *Salix caprea*, apple and cherry ermine moths (*Yponomeuta malinellus* and *Y. padellus*), the false tarnished plant bug, and the gipsy moth, a small colony of which moth was found at Geneva, N. Y.

Report of the Dominion entomologist, C. G. HEWITT (*Canada Expt. Farms Rpts. 1912, pp. 173-189, pl. 1*).—This, the author's third annual report (E. S. R., 27, p. 356), covers the year ended March 31, 1912. It deals briefly with the administration of the Destructive Insect and Pest Act under the headings of inspection and fumigation of imported nursery stock and field work against the brown-tail moth; with insects attacking field crops, including cutworms, chinch bugs, thrips, root maggots, and Colorado potato beetle; insects attacking fruit trees; insects attacking forest and shade trees, including the spruce bud-worm (*Tortrix fumiferana*), larch sawfly (*Nematus erichsonii*), and birch leaf-mining sawfly (*Phlebotrophia mathesoni*); insects attacking domestic animals and man; insects affecting garden and greenhouse; apiculture; etc.

Report of the entomologist, D. T. FULLAWAY (*Hawaii Sta. Rpt. 1912, pp. 16-34, pl. 1*).—The author first reports upon studies made of the 3 mosquitoes which occur in the Hawaiian Islands, namely, the common night mosquito *Culex quinquefasciatus* (*C. fatigans*) and the 2 day mosquitoes *Aedes calopus* (*Stegomyia fasciata*) and *A. scutellaris*, all 3 of which were introduced with shipping within the memory of the Hawaiians. From the focal points of introduction the species have spread generally throughout the islands and in the presence of the conditions requisite for their development are found everywhere from the coast far up into the mountains.

Twelve rearings of *C. quinquefasciatus*, including many hundred individuals, gave the following periods as requisite for their development: Egg stage, 1 to 2 days (mostly 1 day); larval stage, 11 days; pupal stage, 1 to 4 days (mostly 2 to 3 days), giving an average life cycle from deposition of eggs to adult free flying mosquito of 15 days. Eight rearings of *A. scutellaris*, including many hundreds of individuals, gave the following records: Egg stage, 5 to

6 days; larval stage, 15 to 21 days (one record 17 days, another, in which the larval period was protracted by reduction of food, 61 days); pupal stage, 1 to 4 days (mostly 2 days). Three rearings of *A. calopus*, including many individuals, showed the egg stage to require 4 days; the larval stage, 17 days; and the pupal stage, 2 to 3 days for development.

Cultural methods for the control of the pink bollworm (*Gelcchia gossypiella*) have not given the favorable results expected. A bethylid, thought to be (*Goniozus*) *Parasiorola cellularis*, has been found to parasitize the larvæ of this insect, the egg stage requiring 1 day, the larva 7 days, and the pupa 11 days for development. The ichneumonid *Pristomerus hawaiiensis*, previously reported from the sweet potato stem borer (*Omphisa anastomosalis*), and a chalcidid, probably belonging to the genus *Hockeria*, were also reared by the author from this pest.

The author gives a brief account of the life history of the 2 species of weevils, *Bruchus prosopis* and *Caryoborus gonagra*, both introduced pests, which attack the kiawe bean (*Prosopis juliflora*) in Hawaii. The introduction of the parasite *Heterospilus prosopidis* of bean weevils from Texas was made but apparently it has failed to become established. A minute parasite, described as *Uscana semifumipennis*, which attacks the eggs of bean weevils was also introduced and has become established, and proves a most valuable check to the multiplication of the weevils. An examination recently made shows over 25 per cent of the eggs to be parasitized by this species, which has now become rather generally distributed.

Two new genera and 3 new species of parasites of scale insects are characterized for the first time, namely, *Apentelicus kotinskyi*, reared from *Lepidosaphes* sp., at Honolulu; *Adclencyrtus odonaspidis*, reared from specimens from *Odonaspis graminis*; and *Pteroptrichoides perkinsi*, reared from a new genus and species of coccid on Bombay mango at Honolulu.

Lists are given of parasites of Coccidæ and their hosts and of the hosts and their parasites. Brief notes are given on the life history of several species of Coccinellidæ, namely, *Coclophora inequalis*, *C. pupillata*, *Platynus lividigaster*, and *Seymus notescens*. The egg stage of *C. pupillata* requires from 3 to 4 days, the larval stage from 15 to 21 days, and the pupal stage 7 days for development. The egg stage of *P. lividigaster* requires from 3 to 4 days, the larval stage 7 days, and the pupal stage from 5 to 6 days. The egg stage of *S. notescens* requires from 1 to 2 days, the larval stage 10 days, and the pupal stage 5 days.

Brief notes are also presented on the Mediterranean fruit fly.

Some external insect parasites of domestic fowls, G. W. HERRICK (*Jour. Econ. Ent.*, 6 (1913), No. 1, pp. 81-84).—Following a brief discussion the author presents a list of Mallophaga occurring on domestic fowls.

Further data on heat as a means of controlling mill insects, G. A. DEAN (*Jour. Econ. Ent.*, 6 (1913), No. 1, pp. 40-55).—This report of work conducted in continuation of that previously noted (*E. S. R.*, 25, p. 758) presents a brief summary of the successful heating of a few mills, discusses the amount of radiation required, some very important points to be considered in the successful heating of a mill, and the effect of heat fumigation upon flour. Temperature records and other data obtained of mills that have used heat successfully are appended to the account.

Zinc arsenite as an insecticide, W. J. SCHOENE (*New York State Sta. Tech. Bul.* 28, pp. 3-16).—The author here reports upon a series of laboratory and field experiments with zinc arsenite and lead arsenate to determine their relative toxicity to insects and the safeness of zinc arsenite for use on foliage.

"One lb. of zinc arsenite proved equal in effectiveness to 3 lbs. of lead arsenate. Zinc arsenite when added to calcium hydrate or Bordeaux mixture

caused no injury to apple foliage; but more or less spotting of apple leaves occurred when the poison was used singly or in combination with lime-sulphur or glucose. Zinc arsenite alone or with glucose caused severe burning of grape foliage. Laboratory tests suggest that the injury to foliage by zinc arsenite may be due in part to the solubility of the poison in carbonic acid. The contradictory results from the use of zinc arsenite on foliage suggest that the poison as manufactured is not a stable or uniform product. Zinc arsenite or lead arsenate with Bordeaux, soap, or glue continued effective for 25 days. Either of the poisons alone or with glucose gradually lost its poisonous properties on exposure to weather and by the end of this period had ceased to protect the foliage."

The hop aphid in the Pacific region (*Phorodon humuli*), W. B. PARKER (*U. S. Dept. Agr., Bur. Ent. Bul. 111, pp. 43, pls. 10, figs. 8*).—This report is based upon investigations commenced in the spring of 1911 and continued through the fall of 1912. Experiments were conducted and practical control work carried on at Sacramento and Santa Rosa, Cal., and at Independence, Oreg.

The greatest injury from this aphid occurs in Oregon, Washington, and British Columbia, but serious losses are occasionally sustained in California. The author's studies of the life cycle show 2 generations to occur on the alternate host, the second one being winged. Five and 6 generations occur on the hop, a part of the fifth becoming winged and depositing young upon the alternate host, and part being wingless and depositing young (sixth generation) upon the hop, producing the male aphids which fly to and copulate with the young deposited on the alternate host by the winged individuals of the fifth generation. These fertilized females deposit the winter eggs, which, hatching in the following spring, produce the viviparous insects for that season.

The winter egg is deposited upon the plum, prune, and hop in the Pacific Coast States. Observations of the winged migrants at Independence, Oreg., have also shown that they occur upon cherry, alder, peach, and apple, and that they deposit their young upon these plants. The author's observations indicate that the aphids emerge from the egg as early as April 10. Only 2 generations were found on the prune; the second is winged and migrates to the hops during the spring and early summer. In the fall the winged form that produces the sexual female migrates from the hop to its winter host (plum, prune, hop) and later the winged male migrates to the plant on which the sexual female awaits fertilization. The young deposited by the winged aphids are wingless parthenogenic insects, which in from 8 to 12 days grow very rapidly and molt 4 times, immediately after the fourth molt commencing to deposit their young. The number of young deposited by one stem mother was found to be from 29 to 92, with an average of 64 for the 12 aphids under observation. The length of life of the aphids varied from 25 to 38 days, with an average of 30.75 days. The nymphs of the fall migrants became winged in the breeding cages at Perkins, Cal., on August 26 and in the field August 28. Migrants were observed upon plum at Independence, Oreg., September 22, 1912. Young were being deposited there, and upon the next visit to the locality, October 16, many eggs were also present.

Several predaceous insects are mentioned as enemies. The aphid is readily destroyed by several contact insecticides. It is pointed out that several applications may be necessary to control an infestation successfully. If successful control is desired the spraying operations must not be delayed and the work must be very thorough; all of the leaves of the vines should be wetted on both sides. Severe infestations have been successfully checked and clean hops obtained where the spraying operations were thorough.

A bibliography of 34 titles is appended.

Two new Coccidæ, T. D. A. COCKERELL (*Jour. Econ. Ent.*, 6 (1913), No. 1, pp. 142, 143).—A new coccid from the Philippine Islands living on the bark of *Ficus nota*, and commonly attended by an ant (*Dolichoderus bituberculatus*), is described as *Drosicha lichenoides*. A new mealy bug occurring in considerable abundance on a species of *Agropyron*, probably *A. biflorum*, at Glenwood Springs, Colo., is described as *Trionymus violascens*.

The date palm scales and their control, W. E. WILSIE (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 5, pp. 538, 539).—A brief account of *Parlatoria blanchardii* and *Phenacoccus marlatti* which were introduced into California on the edible date.

Results of experiments in controlling the gipsy moth by removing its favorite food plants, A. F. BURGESS and D. M. ROGERS (*Jour. Econ. Ent.*, 6 (1913), No. 1, pp. 75-79).—The experiments here reported followed the determination of the fact that it is exceptional for first stage caterpillars to grow and develop when their diet is confined to certain species, including pine, hemlock, juniper, red cedar, ash, and maple. If, however, half-grown or larger caterpillars feed on the same species, a large percentage of them will develop, and if the same thing happens in the field where the infestation is at all severe, defoliation by the larger caterpillars often results to species which are not particularly favored as a food by the younger larvæ.

The authors find that oaks of all species are the greatest menace to the improvement and development of New England forests as far as the gipsy moth is concerned. If these were cut the injury by this insect would be greatly reduced, and the same holds true with the brown-tail moth. In certain sections the oaks predominate, but the region is suitable for growing white pine, which is far more valuable, and it is becoming apparent that the oaks will be eliminated, either gradually as a result of moth attack and other insect injury, or by the efforts of man to bring about a better forest condition which will at the same time serve to hold these destructive pests in check. "Woodland owners outside the moth infested area should interest themselves in the proper care of their woodlots and should eliminate the oak growth as rapidly as possible so that the trees in their forests will not furnish suitable food for the species when it arrives."

In an area of 7 acres where the tree growth was chiefly chestnut, with some gray birch and oak, and where the infestation was heavy, the oak and other trees, except chestnut and a few conifers, were removed and the brush and slash burned. This left a stand of chestnut trees averaging from 35 to 45 ft. in height, all of which were badly infested. Occasional visits made during the season failed to indicate any defoliation of the chestnut trees. Other experiments along this line, with much similar results, are reported.

Spruce bud worm and spruce leaf miners, O. A. JOHANNSEN (*Maine Sta. Bul.* 210, pp. 11-36, pls. 3, figs. 3).—The author states that during the past 2 or 3 years this insect has been the most serious pest of spruces in Maine. The species appears to be a native of this country, having first been described in 1865, and there are accounts of ravages of an insect believed to be this as early as 1807. It is at present widely distributed over eastern Canada, northern New England, New York, Vancouver, and Manitoba. In addition to spruces it attacks firs, larch (or tamarack), hemlock, and white pine.

The fact that the insect chiefly attacks the buds and new shoots makes its presence in timber land a serious problem. The presence of this pest is made known by the appearance of the trees in late spring or early summer, when they look as if a light fire had passed through them. The caterpillars feed

upon the needles of the new buds or terminal shoots, gnawing the base of the needles, separating them from the twig, and spinning them together by means of the silken thread which they secrete. The larva thus forms a loose shelter, moving about in the space between the twig and loosened needles and bud scale. The caterpillars do not turn their attention to the older growth until the young needles are entirely consumed. It is stated that a recurrence of the attack for 2 or 3 consecutive years in severe infestations will cause the death of the tree.

The caterpillar begins feeding when growth starts in the spring, becoming full fed between the first and middle of June. About the middle of June they transform to brown chrysalids inside the loosely made shelters. In a week or 10 days the small grayish brown moth emerges from the chrysalid dragging the empty case practically out of the larval shelter. The moths may be seen on the wing from the middle of June until toward the latter part of July. Shortly after emergence the moths deposit their pale green scale-like eggs in small oval patches on the sides of the needles, but they are not conspicuous. About Orono the eggs were deposited early in July hatching in a week or 10 days. By July 27 nearly all egg masses examined were empty.

The natural enemies mentioned include spiders which have been determined as *Theridion spirale*, *T. differens*, *Linyphia phrygiana*, *Dictyna volupis*, and an immature Tetragnatha. It is stated that 2 individual spiders observed were capable of exterminating several hundred newly hatched larvæ. The parasitic enemies mentioned include the dipterous parasite *Exorista vulgaris* and the hymenopterous parasites *Pimpla ontario*, *P. conquisitor*, *Apanteles*, sp., etc.

In timber land remedial measures are impractical, but for the protection of ornamental trees an arsenical spray will keep the pest under control. Arsenate of lead applied at the rate of 5 or 6 lbs. per one hundred gallons of water is thought to be the simplest and most reliable remedy, the applications to be made soon after the young shoots open and repeated within a week or 10 days.

Brief notes are given on 2 spruce leaf miners, namely, *Recurvaria piceacella* and *Epinotia piceafoliaria*, also on *Rhogas canadensis*, which may prove to be a parasite of *E. piceafoliaria*.

The stable fly (*Stomoxys calcitrans*), an important live stock pest, F. C. BISHOPP (*Jour. Econ. Ent.*, 6 (1913), No. 1, pp. 112-126, pls. 2).—The author here reports studies made of the life history and habits of the stable fly during an outbreak of this pest in northern Texas. The outbreak of this fly, which was practically coextensive with the area where grain was extensively produced in 1912, centered in Grayson, Cook, Collin, and Denton counties. The investigations showed that the flies were developing in great numbers in straw stacks, the abundance being largely governed by the number of straw stacks in a given district.

While their injury to live stock brought about by worry was the most serious, their attacks resulted in bringing on acute Texas fever in cattle which already harbored the piroplasm in their blood, and in reducing the milk output from 40 to 60 per cent. They also caused work teams and fat cattle to lose weight, and horses to become lame through stamping.

The life history studies show that the stable fly breeds in straw of oats, rice, barley, and wheat, horse manure, lot manure, and cow manure, the substances being listed in the approximate order of their importance. The vast majority of flies undoubtedly breed in decaying straw, either pure or mixed with manure. An examination of oat and wheat straw stacks during the latter part of August and early September, 1912, showed that far more larvæ developed in oat straw than in wheat straw.

During moderately cool weather feeding usually takes place each day, but when the weather is warmer digestion proceeds faster and flies may engorge twice during one day. It has been found that adults will feed in midday during the extremely hot weather and also when the temperature is as low as 55° F. In a large series of tests the flies have been found never to deposit before the third feeding on blood and usually 4 engorgements are necessary. The greatest number of depositions by a single fly observed was 3, with a total of 278 eggs. In one instance a female was engorged more or less completely 14 different times and deposited 2 lots of eggs. Flies fed on blood at rather short intervals lived 17 days. The length of the egg stage was found to vary from 1 to 4 days. The minimum developmental period from egg to adult ranged from 23 to 32 days, according to the character of the food supply. The pupal stage varied from 6 to about 20 days, and the total period from egg to adult from 19 to over 42 days. Probably most of the individuals which successfully hibernate in the latitude of Dallas pass the winter in the larval and pupal stages.

Two hymenopterous parasites were reared in numbers from the pupæ in a number of lots of *Stomoxys*; one is *Spalangia muscæ*, the other an undetermined species of the family Pteromalidæ. Forty per cent of the pupæ collected from straw and kept in the laboratory yard at Dallas, Tex., were parasitized by these 2 species. In breeding experiments it was determined that the parasitism always takes place in the pupal stage. Both of the parasites have been found to attack the pupæ of the house fly and the horn fly, as well as other muscid pupæ.

Work on the Mediterranean fruit fly in Hawaii, H. A. WEINLAND (*Mo. Bul. Com. Hort. Cal.*, 1 (1912), No. 9, pp. 570-583, figs. 5).—A discussion based upon investigations by the author in Hawaii.

The introduction, methods of control, spread, and migration of the Mediterranean fruit fly in the Hawaiian Islands, H. H. P. SEVERIN (*Mo. Bul. Com. Hort. Cal.*, 1 (1912), No. 9, pp. 558-565).—This paper is based upon studies conducted by the author. It includes discussions of the manner of introduction and spread of the fruit fly into the Hawaiian Islands, traps, mixed oils, sprays and spraying, clean culture and migration experiments with 2,000 marked male fruit flies, liberated from 3 different localities in the Manoa Valley, which is more than 2 miles in length and the greater portion of which is about $\frac{3}{4}$ mile wide, being walled in by mountains on all sides, except the seaward side.

A total of 115 marked insects were recaptured, mostly during the first 15 days after the experiment had been started. The captures were at distances varying from a quarter of a mile to a mile and a half from their respective points of liberation. "The males liberated during calm spells often required from 1 to 2 weeks to fly a mile or more. In numerous instances kerosene traps were kept in the same tree for a period of 2 weeks and specimens were captured from time to time, indicating that the entire flight was not made at one time."

The flight of 2,000 marked male Mediterranean fruit flies (*Ceratitis capitata*), H. H. P. SEVERIN and W. J. HARTUNG (*Ann. Ent. Soc. Amer.*, 5 (1912), No. 4, pp. 400-408, pl. 1, figs. 3).—A more detailed account of the investigations noted above.

Precautions taken and the danger of introducing the Mediterranean fruit fly (*Ceratitis capitata*) into the United States, H. H. P. SEVERIN (*Jour. Econ. Ent.*, 6 (1913), No. 1, pp. 68-74).—A general discussion of the manner in which this fly may gain entrance into this country.

The wheat leaf miner (*Agromyza parvicornis*), J. S. HOUSER (*Ohio Sta. Bul.* 251, pp. 79-86, figs. 7).—This dipteran, originally described by Loew in 1869 from specimens received from Washington, D. C., and referred to but once since

that time, is said to have appeared in June, 1909, as a pest in experimental wheat plats at the station. During the season of 1910, it appeared in slightly increased numbers, but during 1912, only an occasional mined leaf was to be found.

During the larval stage this insect is a true miner, feeding upon the mesophyll of the leaf. So far as has been observed the upper leaves only are affected and the larva as a rule confines its operations to the outer half of the leaf, the tendency of the pest being to inhabit the distal portion. After the leaf is mined the dermis on both sides becomes brown and dry, thus resulting in the injured area becoming functionless. At present the insect is not a serious pest, as not over 15 to 20 per cent of the plants are affected, even during those years when it has been most plentiful.

The eggs are deposited in tunnel-like incisions extending lengthwise of the leaf. On June 13, the earliest date upon which egg laying was observed, a few mines were found which contained partially grown larvæ. Under normal field conditions 4 days are required for the incubation of the egg. Upon hatching out the larvæ at once begin feeding and continue mining in an almost straight line toward the tip of the leaf, gradually enlarging the tunnel laterally as the increasing size of its body demands. From 7 to 9 days are required for the development of the larvæ. Upon completion of its growth the larvæ bursts a slit in the upper leaf surface, and, escaping, falls to the ground, and burrows down to a depth of about 2 in., where the puparium is soon formed. It is thought quite probable that there are 2 annual broods.

In addition to occurring in wheat, the author has observed the insect ovipositing in timothy leaves and also has found rye and barley leaves bearing the characteristic mines and larvæ.

Chilocorus similis and its relation to scale insects in Japan, S. NAKAYAMA (*Mo. Bul. Com. Hort. Cal.*, 1 (1912), No. 13, pp. 932-936, fig. 1).—There are 2 generations of this beetle each year. A few days after emerging from hibernation, which is passed under dead leaves or in the cracks of bark, eggs are deposited under scales. Usually one is laid under each scale, but there may be often 2 and sometimes 3 under a single scale. The eggs are also deposited under bark or between cracks, wherever a suitable place is found. Records of 4 lady beetles show 14, 16, 17, and 18 eggs, respectively, to have been deposited within a period of less than one month. The larvæ molt 3 times before pupating. The adult lady beetle feeds upon scales by lifting the scale and pulling out the body; the larva makes a hole in the scale, and then pulls the body out through the hole, or pushes the head into it.

The principal food of this lady beetle consists of scale insects, especially the young; it very seldom feeds on aphids. In Japan it feeds upon the San José scale, *Pseudaulnidia duplex*, *P. pæoniae*, the West Indian peach scale, and *Parlatoria proteus*, the West Indian peach scale being preferred, with the San José scale second. In the first stage the larva consumes but a few scales, on an average 1 or 2 young scale insects, but in the fourth stage, it may eat more than 50 scales a day. Most of the larvæ eat from 700 to 800 scales during the total larval period, and the adult lady beetle eats from 800 to 900, averaging from 20 to 40 scales daily. The length of life of the adult is said to be about 35 or 36 days.

Potato flea beetle (*Epitrix cucumeris*), O. A. JOHANSEN (*Maine Sta. Bul.* 211, pp. 37-56, pl. 1, figs. 4).—Next to the Colorado potato beetle, *E. cucumeris* is the most destructive of the annually recurring insects on the foliage of the potato in Maine. In addition to its direct injury, it is thought to be an active agent in spreading early blight through carrying the spores from plant to plant on its body.

The author finds that in Maine there is but one generation or at most only a partial second generation. In 1912 the first eggs were observed on June 26 and none were found later than the middle of July. "On July 30 full-grown larvæ and a few pupæ were found among the roots of these plants, the larvæ mining in the seed potato, the body over half buried within the tuber, the posterior end sticking out at right angles to the surface. The pupæ as well as some of the larvæ were found free in the earth among the roots. . . . During August, 1912, larvæ and pupæ were to be found in the ground among the young tubers but by the end of the first week in September they had all disappeared. About the middle of July the beetles of this generation begin to emerge in Maine, becoming very abundant upon the potato vines and reaching a maximum about the first of September. The first killing frost in September marks the disappearance of the beetles to their places of hibernation."

It is pointed out that this beetle, which is often called the cucumber flea beetle because it was originally described as feeding on the cucumber, feeds by preference upon plants of the family Solanaceæ which includes the potato and the tomato. A test of the susceptibility of various plants to the attack of this insect is briefly reported.

In spraying experiments with arsenate of lead and with a combination of Bordeaux mixture and arsenate of lead, both with and without corn sirup at the rate of $2\frac{1}{2}$ qt. of sirup to 50 gal. of spray mixture, in which the applications were made every 2 weeks during the season, there was decidedly more flea-beetle injury in the unsprayed check plats than in the sprayed, and the least injury in the plats sprayed with a mixture containing Bordeaux. There was no noticeable difference between the plats which were sprayed with the mixture containing sirup and the corresponding one without it. In laboratory experiments, however, the addition of sirup to the arsenical used aided in destroying the beetles.

A bibliography, arranged alphabetically by authors, is appended to the paper.

A list of insects recorded on potato, arranged alphabetically by orders, by Edith M. Patch (pp. 51-56) concludes the bulletin.

The potato flea beetle (*Maine Sta. Doc. 467, pp. 7, figs. 5*).—This is an abstract of the bulletin above noted.

The control of the alfalfa weevil, E. G. Titus (*Utah Sta. Circ. 10, pp. 105-120, figs. 15*).—This is a brief account of the alfalfa weevil, its present distribution, and the principal methods that appear to be of value in its control.

During the years 1911-12 the weevil spread over many miles of territory, both north, south, and southeast, so that its present distribution includes Weber, Morgan, Davis, Salt Lake, and Utah counties in Utah, and parts of Uinta County, Wyo.; Bear Lake and Oneida counties, Idaho; and Box Elder, Cache, Rich, Summit, Wasatch, Sanpete, Millard, Juab, and Tooele counties, Utah. Thus far the author has found no mountain range in Utah that appeared to obstruct in any way the movement of the weevils. Weevils have been taken as high as 9,500 ft. in Salt Lake County, where they had apparently been carried partly by winds when they were flying. Among the remedial measures recommended are late disking or spring-toothing in order to keep the alfalfa growing rapidly in the spring; removal of the first crop as soon as serious injury occurs, followed immediately by a thorough use of the spring tooth and brush drag; rotation of alfalfa at least every 4 or 5 years; and the cleaning up all around the farm, especially canals, ditch banks, weed patches, gardens, etc.

Notes on the rice water weevil (*Lissorhoptrus simplex*) and its control, W. NEWELL (*Jour. Econ. Ent., 6 (1913), No. 1, pp. 55-61*).—This paper reports observations made during the summer of 1909. It deals with the habits of the adults and larvæ, duration of generations, and control measures. An account

of investigations of this pest by Tucker has been previously noted (E. S. R., 27, p. 562).

The raspberry horntail (*Hartigia abdominalis*), E. O. Essig (*Mo. Bul. Com. Hort. Cal.*, 1 (1912), No. 12, pp. 889-901, figs. 12).—Reports of damage to raspberries and blackberries by "flies" which were afterwards found to be horntails, received in February and March, 1912, principally from Placer County, Cal., led to the investigations here reported.

The insect is generally distributed throughout the central and northern foothill counties of the State. The principal damage is done to the young and thrifty new growth or canes some time before the appearance of the blossoms. The initial injury is caused by the first hatched larvæ which after attaining a length of nearly $\frac{1}{2}$ in. bore spirally around and down the cane in the cambium layer until the middle pith is reached. The complete girdling of the growing part of the shoots causes them to die within a few days, the portion above the spiral being completely destroyed. Upon entering the pith the larva first ascends to the tip, or if the shoot dies before the extremity is reached, it retraces its path and continues on down the pith. In spite of the attack the bushes recovered and sent out new shoots just below the spiral made by the larvæ and a good crop was produced, though many canes were killed outright, thus causing some loss. Canes not affected by horntails failed to throw out these spurs and produced earlier and larger berries in somewhat greater numbers.

The eggs are inserted in a slit just beneath the bark of the young canes, usually only one in a cane but in a few cases two have been found. The point of insertion is generally near the second or third leaf axil and within 6 or 8 in. of the tip. At Bowman, Cal., egg laying begins the first of May and continues until after the middle of the month. Upon hatching the larvæ remain for a while near the place in which the egg was deposited, feeding upon the surrounding tissues, but never disturbing the outer bark before commencing their journey downward. The spirals formed may consist of from 1 to 3 complete rings, which may be compact, occupying $\frac{1}{2}$ in. of the length of the canes, or if loose, occupying more than 1 in. "As soon as the branch is dead the larvæ turn and retrace their paths downward, working on the middle pith alone, all of which is digested or converted into frass behind. The length of the burrows varies considerably. In most cases the larvæ stop within 1 or 2 ft. of the ground for pupation, while in others they may continue to the surface of the soil or to the very roots. During this downward path apparently no damage to the cane is done. The larval stage occupies most of the summer months, from April to October, though during this period there are many overlapping broods. The average age for each larva is from 4 to 6 months." The larvæ spin a thin white silken cocoon or web within the burrow and pupate, the transformation requiring from 1 to 2 months. When fully developed the adult insect gnaws a hole through the side of the cane and escapes.

While at present a pest only in the higher altitudes of Placer, Amador, and Nevada counties, it has also been reported as occurring in Tehama, Butte, and Sacramento counties, where some damage is being done. Thus far only one native food plant, the wild rose, has been reported. At present the most damage is being done to the raspberry fields in the higher altitudes where such berries are raised to a considerable extent. In many fields in Placer County over 90 per cent of all canes were affected. It also works on rose bushes, entirely destroying the year's crop. In Sacramento they were found attacking the canes of blackberries in the same manner as in the raspberries and roses. Loganberries are also among the hosts.

Attempts to remove the pest by trimming off all infested canes as soon as they began to show signs of attack resulted in the infestation of from 80 to 90 per cent of all young shoots the following spring. It is thought that the pest may best be dealt with by crushing the eggs with the thumb or finger by slight pressure over the discolored area where they are deposited.

On the feeding habits of *Pimpla (Itoplectis) conquisitor*, F. A. JOHNSTON (*Jour. Econ. Ent.*, 6 (1913), No. 1, pp. 144-147).—The author reports observations of the feeding of this ichneumonid parasite at punctures made by its ovipositor in larvæ and pupæ of *Autographa brassicæ*.

The red spider on hops in the Sacramento Valley of California, W. B. PARKER (*U. S. Dept. Agr., Bur. Ent. Bul. 117, pp. 41, pls. 6, figs. 9*).—This report of investigations, commenced on January 1, 1911, and extending over a period of 18 months, is based on observations made in the hop fields in all parts of the Sacramento Valley, where spraying experiments were conducted on both a large and small scale.

This pest was reported in injurious numbers in hop fields at Wheatland, Yuba County, Cal., in 1902, since which time it has caused some injury to hops in the Sacramento Valley every year, and in 1910 the hop crop was seriously injured in many localities. It has also been a source of injury in the State of Washington and at Agassiz, British Columbia. The attack of these mites results in the leaves becoming speckled, turning yellowish, and when severely injured drying up and falling to the ground. The mites were not observed to feed upon hops until they were full size. The decrease in the vitality of the vine, which is the direct result of the attack by mites, produces a premature ripening of the hops.

The eggs of *Tetranychus bimaculatus*, the mite concerned, are deposited singly among the webs and upon the underside of the leaves. During February, 1912, the incubation period at Berkeley, Cal., was found to be from 8 to 10 days; during May the period was from 5 to 10 days, with an average of 7.2 days, while in July, 1911, it was only 4½ days. The length of the larval and nymphal periods was found to vary from 8 to 16 days, according to the temperature. Observations by the author show that parthenogenesis occurs with the red spider. The winter is passed upon wild plants in and around the hopyards. In experiments conducted on sheets of paper, the surface of which corresponds fairly well to that of the hop vine, it was calculated that an average female mite is capable of covering 211 ft. of vine surface during a period of 10 hours. In 1910 the first mite observed upon a hop vine was found April 21 in the center of a yard near Sacramento, where it was surrounded by 8 eggs and protected by a small amount of dusty web. The mites were found to appear simultaneously in various parts of the hop fields and did not invade the yards from along the edges as was formerly supposed to be the case.

This mite has a remarkably large number of host plants, belonging to a wide range of families, including glabrous and hirsute plants. It is in fact nearly omnivorous as far as plant life is concerned.

Of the predaceous enemies the small anthocorid bug *Triphleps tristicolor* is said to be the most numerous. Several small lady beetles, including *Scymnus nanus*, *S. marginicollis*, and *Pentilia* sp., were found to prey upon this red spider. *Chrysopa californica* in the larval stage is said to have been very abundant during July and to probably have done more good than all the rest of the predaceous insects together.

The remedial experiments here reported in detail have led to the following conclusions: "The mites on hops are not affected by any form of dry sulphur, but are readily killed by several contact insecticides, the cheapest and most convenient of which are flour paste (8:100) or a combination of lime-sulphur, 36°

B. (1:100), and flour paste (4:100). To get the best results it is essential that the vines should be thoroughly sprayed. Stripping the vines and burning the leaves is an excellent measure, but should not be entirely relied upon as a complete control. When the infestation is severe early in the season and the mites are above the point of stripping, spraying operations should be commenced as soon as the vines are stripped. The infested area must be thoroughly and rapidly covered and must be sprayed a second time, 7 or 10 days later.

"Banding with tree tanglefoot will check migrations and is recommended where the hopyards are infested by food plants of the red spider. Two later applications may be necessary if the mites again appear in injurious numbers." The red spider on the hop vine may be economically controlled if these measures are carefully carried out.

A bibliography of 27 titles is appended.

Some natural enemies of spiders and mites, H. J. QUAYLE (*Jour. Econ. Ent.*, 6 (1913), No. 1, pp. 85-88).—The data here presented are based upon the investigations previously noted (*E. S. R.*, 28, p. 457).

The effects of spraying, H. S. FAWCETT (*Florida Sta. Rpt. 1912*, pp. LXXIII-LXXVII).—Spraying experiments conducted in the spring of 1911 with Bordeaux mixture 3:3:50; commercial lime-sulphur (1 gal. to 25 gal. water); and Yothers' Formula IV, consisting of 3 gal. Junior red engine oil and 2 gal. whale oil soap to 200 gal. of water, are reported in tabular form. Three localities were chosen and one plat was sprayed at each locality in May, July, and September.

"Counts of the numbers of scale insects per fruit and per leaf, and of the white fly per leaf were made, one about September 1, a second on November 1, and a third about December 1. It was found that Bordeaux mixture caused an overwhelming increase of scale insects. The use of commercial lime-sulphur, in the first 2 counts, somewhat diminished the number of scale insects; but later, in the third count, caused a slight increase; while Yothers' Formula IV cut them down to practically nothing. The evident reason for the increase of scale insects with the use of Bordeaux is that Bordeaux mixture kills the fungi that are parasitic on the insects, and thus allows them to increase. This increase was so great as to cause much injury to the tree. In one case the leaves fell off at the end of the season."

A tick the probable carrier of verruga, C. H. T. TOWNSEND (*Inca Chron.*, 5 (1913), No. 3, pp. 13-18).—The author discusses the nature of this disease of man which occurs in parts of Peru, presenting the evidence which leads him to conclude that it must be transmitted by ticks.

The possible and probable etiology and transmission of verruga fever, C. H. T. TOWNSEND (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 211-225).—A somewhat more detailed discussion of the subject than is given in the paper noted above.

FOODS—HUMAN NUTRITION.

Minnesota wheat investigations.—Series 1, milling, baking, and chemical tests, crop of 1911, C. H. BAILEY (*Minnesota Sta. Bul. 131*, pp. 42, figs. 6).—Spring sown Bluestem, Fife, and Velvet Chaff or bearded spring wheat, are the varieties principally grown in Minnesota.

According to the author's summary of the investigations reported, the spring wheat crop of 1911 was of rather poor quality owing to adverse weather conditions and to rust. The samples studied showed wide ranges in composition and milling quality. The variations in the composition of the hard spring wheats were

largely due to environment, including climate and soil, and also apparently to the rainfall during the growing season, the average percentage of protein in the flour decreasing fairly regularly as the rainfall during the growing period increased.

The spring wheat samples obtained from the southwestern part of the State showed the highest baking strength on an average, while those obtained from the northwestern part were poorest in this respect. Samples from the southeastern section showed the highest percentage of total flour on an average, while the lowest percentage was obtained from samples from the central section, owing to the large proportion of badly shriveled kernels which they contained.

Samples of the 1911 crop of Montana grown hard spring wheats, which were also tested, were nearly equal in average milling quality to the same class of wheats grown in Minnesota. The hard red winter wheats of the Turkey type grown in Montana were inferior to the hard spring wheats grown there and in Minnesota.

The methods followed in making experiments are outlined, and illustrations are given of the electrically heated fermentation cabinet in which the doughs were raised and of the electric oven in which the bread was baked.

The influence of the environment on the milling and baking qualities of wheat in India.—II, The experiments of 1909-10 and 1910-11, A. HOWARD, H. M. LEAKE, and GABRIELLE L. C. HOWARD (*Mem. Dept. Agr. India, Bot. Ser.*, 5 (1913), No. 2, pp. 106, pl. 1, fig. 1).—This paper reports the continuation of work previously noted (*E. S. R.*, 23, p. 768). General data are given, together with a report including the results of baking and milling tests applied to several varieties of wheat, each grown in a number of regions in India. The conclusions are summed up in part as follows:

"Weak wheats . . . can be improved to some extent . . . by cultivation, but they have not been made to behave like strong wheats." Strong wheats retain strength and good milling qualities in the various wheat-growing regions. The quality and yield of the crop are affected by the same conditions, and the authors recommend the use and improvement of a wheat combining high yielding power and good baking qualities.

Processes of flour manufacture, P. A. AMOS (*London, New York, Bombay, and Calcutta, 1912, pp. X+280, figs. 112*).—To a lack of literature and instruction on flour milling in England is attributed the writing of this volume.

The introductory chapters describe the general conditions peculiar to England, the history of flour milling, and the characteristics of wheat lands and wheat in various parts of the world. The greater part of the volume is devoted to the technical features of mill construction, equipment, and operation, but at the end there is a brief discussion of the subject-matter of the annual examinations given under the auspices of the City and Guilds of London Institute and the National Association of British and Irish Millers.

Grain Germ as food, H. BORUTTAU (*Ztschr. Phys. u. Diätet. Ther.*, 16 (1912), No. 10, pp. 577-583; *abs. in Zentbl. Biochem. u. Biophys.*, 14 (1912), No. 3-4, p. 103).—Experiments with man and animals showed that the nitrogen of a commercial food product made from grain germ was about as digestible as that of meat and that it stimulated the growth of dogs, rabbits, and mice.

The occurrence of nicotinic acid in rice bran, U. SUZUKI and S. MATSUNAGA (*Jour. Col. Agr. Imp. Univ. Tokyo*, 5 (1912), No. 1, pp. 59-61; *abs. in Chem. Zentbl.*, 1913, I, No. 11, p. 1036).—The authors report the occurrence of nicotinic acid in rice bran in a quantitative study.

The composition of different varieties of red peppers, L. M. TOLMAN and L. C. MITCHELL (*U. S. Dept. Agr., Bur. Chem. Bul.* 163, pp. 32).—The investigations reported were undertaken to determine the normal composition of the

best known commercial varieties of red peppers in order to ascertain the characteristic properties of each part and thus secure information which would lead to the detection of the presence of abnormal amounts of seeds and stems. The study embraces analyses of nearly all the commercial varieties of red pepper, including the African and the Japanese cayenne or chillies, the Hungarian paprika, and the Spanish pimenton, or pimiento.

Cayenne or chilli is a small fruited pepper, a variety of *Capsicum frutescens*, indigenous to tropical America, but now grown or cultivated in nearly all tropical or subtropical countries. This pepper is characterized by the small size of the pods and their extreme pungency. The leading commercial varieties in 1911, according to the authors, were the African and the Japanese.

Paprika, according to the authors, "is a large fruited pepper, grown in Hungary, a variety of *Capsicum annum*, a species of *Capsicum*, which is a genus of the family Solanaceæ. When powdered, it has a deep red color and a sweetish, mildly pungent flavor. Its origin is somewhat obscure, but it apparently originated in America, whence it can be traced from Spain, through Greece and Turkey, to Hungary. It has been variously designated as Turkish pepper or paprika, Hungarian pepper or paprika, or garden pepper."

With reference to the proper terminology of the third kind of pepper considered, the authors note that pimenton, or pimiento, is the accurate name for the large fruited pepper, a variety of *Capsicum annum*, grown in Spain. The succulent pericarp of it is much used for stuffing olives and for other purposes, while the dried pod is ground as a spice. "'Pimenton' should not be confused with 'pimento', or 'pimenta,' which is applied to Jamaica pepper or allspice. 'Pimenton' is the definite term used to designate the Spanish product, when ground."

In general, the analytical data showed the impracticability of having a single standard for the various sorts. Each type should be judged in comparison with samples of the same sort from a known source.

"It appears that climatic and cultural conditions undoubtedly have a great effect not only on the quality of the pepper but also on the amount of sand or ash which may be present."

An extended bibliography is appended.

The induction of nonastringency in persimmons at supranormal pressures of carbon dioxid, F. E. LLOYD (*Science, n. ser.*, 37 (1913), No. 945, pp. 228-232).—This paper is concerned chiefly with the relation, in the induction of nonastringency, between pressure and time of treatment. A test for astringency is described which is based on the reaction of the tannin mass of the persimmons with alkaloids. See also a previous note (E. S. R., 26, p. 327).

Soaking nuts, M. FREHSE (*Ann. Falsif.*, 6 (1913), No. 54, pp. 163, 164).—The experiments here reported were designed to show the changes in weight and appearance of nuts subjected to soaking for different periods and to suggest means of detecting the practice.

The author finds that the gain in weight from soaking is from 20 to 45 per cent. Means of recognizing soaked nuts, aside from the general ones of external and internal appearance, are (1) the perceptible exudation of water when a joint between two parts of the shell is pricked and (2) the fact that soaked nuts dry much more rapidly than fresh ones.

The manufacture of preserved foods and sweetmeats, A. HAUSNER, trans. by A. MORRIS and H. ROBSON (*London, 1912, 2. Eng. ed.*, pp. VIII+238+24, figs. 28).—The author states that this, the second English edition of a book previously reviewed (E. S. R., 14, p. 787), has been thoroughly revised.

The question of sulphurous acid in white wines, P. MALVEZIN (*Abstr. in Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 19*

(1912). *Sect. VIII*, p. 209).—After a critical study of the purely experimental results obtained by a commission named at Bordeaux to study the physiological effect of sulphurous acid in white wine, the author believes that the use of this preservative in the wine should be strictly regulated until the actual dose that the human organism can tolerate has been determined by an international commission appointed for that purpose.

Table luxuries, A. GROTH and J. KAUP (*In Handwörterbuch der sozialen Hygiene. Leipzig, 1912, pp. 389–397*).—A brief treatise on the value, cost, and extent of consumption of luxuries, with special reference to tea, coffee, and tobacco.

The gases evolved from roasted coffee, their composition and origin, R. A. GOULD (*Abs. in Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 26 (1912), Sects. VIa–XIb, App., p. 389*).—The author observed that ground roasted coffee gave off gases (CO_2 and CO) when packed in containers and exhausted.

The proportion of CO_2 to CO was greater when the coffee was packed under diminished pressure than under normal pressure. The gas is believed to be due to the decomposition during the roasting process of glucosid-like bodies in the green bean.

The elimination and toxicity of caffeine in nephrectomized rabbits, W. SALANT and J. B. RIEGER (*U. S. Dept. Agr., Bur. Chem. Bul. 166, pp. 31*).—According to the authors' summary of their investigations, "the removal of both kidneys in the rabbit stimulates to a marked degree the elimination of caffeine by the stomach, and to a greater degree the elimination by the intestines.

"The amount of caffeine found several hours after injection compared with the amounts recovered about 24 hours after injection indicate that absorption goes on simultaneously with excretion. That reabsorption takes place is shown by the absence of caffeine from the gastrointestinal canal and by the presence of very small quantities of it in the feces of nephrectomized rabbits which lived 5 to 7 days after the injection.

"Elimination is most active during the first few hours after injection of caffeine, being more rapid by the intestine than by the kidney.

"The undiminished resistance to the single dose and tolerance for large amounts of caffeine when subminimum doses are injected at sufficiently long intervals points to the formation of substances antagonistic to caffeine after the removal of both kidneys."

For earlier work see a previous note (E. S. R., 27, p. 464). A bibliography is appended.

The influence of caffeine on mental and motor efficiency, H. L. HOLLINGWORTH (*Arch. Psych., 1912, No. 22; Columb. Contrib. Phil. and Psych., 20 (1912), No. 4, pp. V+166, figs. 31; rev. in Med. Rec. [N. Y.], 82 (1912), No. 7, pp. 294–296*).—The results are given of a psychological study of the effects of caffeine on 16 individuals ranging in age from 19 to 39 years.

With the steadiness test, doses of 1 to 4 grains were followed by slight nervousness, while 6 grains produced marked unsteadiness. Small amounts of caffeine (1 to 3 grains) stimulated the power of coordination and increased the speed of typewriting, while larger doses (4 to 6 grains) retarded both. Both large and small doses stimulated the speed of association of ideas. Small doses had no sleep-disturbing effect but doses of 6 grains impaired sleep except in a few cases. The effect of caffeine, as shown by all the tests applied, was greatest when taken on an empty stomach and least when taken with meals, especially in the morning. Its effect seemed to be independent of age or sex but varied inversely with the body weight of the individual.

Study of the effect of a preservative containing benzoic acid upon chopped meat, O. MEZGER, H. JESSER, and K. HEPP (*Chem. Ztg.*, 36 (1912), Nos. 139, pp. 1357, 1358; 146, pp. 1418-1421; 147, pp. 1430, 1431).—Analytical and general data are reported regarding the effects of treatment of samples of chopped meat with a preservative containing benzoic acid, both freshly prepared samples and those in various stages of decomposition being treated.

The fresh appearance of the meat was maintained by the preservative in the fresh samples and restored to the decomposed samples even where the decomposition was not inhibited. Meat which had undergone putrefaction to the extent of possessing an offensive odor was restored to the appearance of freshness by the preservative. The authors advise strongly against the use of such preservatives with meats as they are dangerous and give the meat a deceptive appearance.

American pure food and drug laws, J. WESTERVELT (*Kansas City, Mo., 1912*, pp. X+1535).—As the subtitle states, this compilation comprises "the statutes of the United States and of the several States of the Union on the subject of foods and drugs, their manufacture, sale, and distribution, whether in interstate or foreign commerce; the administrative rules and regulations of the federal and state departments and commissioners, and the standards of purity, etc.; to which are added chapters on related subjects, such as insecticides and fungicides, commercial feeding stuffs, etc.; with full editorial commentaries and numerous citations to federal and state decisions."

Thirteenth annual report on food adulteration under the pure food law, W. M. ALLEN, W. A. SMITH, and C. E. BELL (*Bul. N. C. Dept. Agr.*, 33 (1912), No. 11, Sup., pp. 107).—The results are summarized of the examination of a large number of samples of foods and drugs, as well as some notes on the operation of the state pure food law.

[Food, drug, and dairy inspection], S. E. STRODE (*Ann. Rpt. Ohio Dairy and Food Comr.*, 27 (1912), pp. 127, figs. 4).—A progress report and general data are given.

[Inspection of foods, drugs, dairy products, and agricultural seeds], L. DAVIES (*Bien. Rpt. Dairy and Food Comr. Wash.*, 9 (1911-12), pp. 67).—A report of the progress made and analytical data regarding a large number of samples inspected.

Report of the department of food and drugs control for the period ending December 31, 1912, A. A. CODD and S. C. DINSMORE (*Nevada Sta. Rpt. Dept. Food and Drugs Control, 1912*, pp. 46, pls. 2).—The results are presented of the examination of a large number of samples of miscellaneous foodstuffs, waters, and drugs.

First annual report of the department of weights and measures for the year ending December 31, 1912, A. A. CODD and S. C. DINSMORE (*Nevada Sta. Rpt. Dept. Weights and Measures 1912*, pp. 20, pl. 1).—The character and extent of the work done under the state law are described, and a list is given of the scales and materials condemned.

Nutrition, A. GROTHJAHN and J. KAUP (*In Handwörterbuch der sozialen Hygiene. Leipzig, 1912*, pp. 118-157, figs. 5).—A short treatise on human nutrition.

The principal facts regarding food, digestion, assimilation and metabolism, and excretion are discussed briefly; and a large amount of general and statistical data is given concerning the composition and food value of the principal food materials, diets of individuals and families, budgets, and the improvement of nutrition of poorer people through municipal restaurants, school lunch rooms, and similar institutions.

Food consumption and female labor from the standpoint of household economics, RENETTA BRANDT-WYT (*Hauswirtschaftliche Nahrungsmittelkon-*

sumtion und Frauenarbeit. Munich and Leipsic, 1912, pp. IV+123).—This is a study of consumption as affected by different forms of family and group life and other social conditions, especially by the transfer of women's productive activity from the household to the industrial world. Although it contains some historical material of a general nature it is concerned mainly with German conditions as shown in recent official statistics.

Committee on school lunches of the Home and School League, H. H. BONNELL ET AL. (*Com. School Lunches Home and School League [Phila.] Ann. Rpt., 2 (1911-12), pp. 31, figs. 2*).—A progress report of the Philadelphia school lunch project.

The effect of school lunches on the home, cooperation by mothers, the work of student dietitians, numerous charts, diagrams, and illustrations, school lunch menus, and other similar data are presented, as well as a bibliography.

Health and longevity through rational diet, A. LORAND (*Philadelphia, 1912, pp. X+416*).—In this volume the author discusses the influence of food upon man, the fundamental laws of rational feeding, effects of different methods of feeding and various food substances, vegetarianism, rational feeding, and similar topics.

Especially interesting are the statements based on his experience as a physician at Carlsbad. In addition to the data which rest upon well established empirical or experimental evidence, much has been included which may be regarded as belief or tradition and which seems less important.

Problems of physiological and pathological chemistry, O. VON FÜRTH (*Probleme der Physiologischen und Pathologischen Chemie. Leipsic, vols. 1, 1912, pp. XV+634; 2, 1913, pp. XIV+717*).—This work, based on the author's lectures designed for the use of students, physicians, biologists, and chemists, presents particularly the results of recent progress and tendencies.

The first volume deals with tissue chemistry, and considers the following topics: Hydrolysis of proteins; oxidative cleavage of proteins; protein putrefaction; cyclic complexes of the protein molecule and their fate in the organism; albumoses and peptones; protamins and histones; polypeptids; nucleic acids; muscle tissue; phosphatids; chemistry of nerve tissue; blood coagulation; hematin, bilirubin, urobilin; proteins of the blood serum, lymph formation, exudate and transudate; skeletal tissue; the liver and its secretory functions; bile acids; male and female sexual organs; fecundation; the kidneys; the suprarenals; the thyroid; the hypophysis; spleen; thymus and bone marrow; melanins; and tumors.

The second volume deals with metabolism, as follows: The digestibility of protein in the stomach; the protein-digesting ferments of the pancreas and intestine; proteolytic and peptolytic ferments; physiology and pathology of purin metabolism; digestibility of carbohydrates; sugar formation from protein and fat; digestibility, resorption, and metabolism of fat; food requirements; hunger; ferments; catalases; and other questions concerned with normal and pathological metabolism.

Studies on water drinking.—XIV, The digestive efficiency of saliva as increased by dilution with water, O. BERGEIM and P. B. HAWK (*Jour. Amer. Chem. Soc., 35 (1913), No. 4, pp. 461-476, figs. 4*).—This a continuation of earlier work by Hawk et al. (*E. S. R., 27, p. 465*). The conclusions reached by the authors are as follows:

"On the basis of experiments made in vitro it is apparent that the digestive efficiency of normal human saliva is increased when such saliva is diluted. The optimum dilution is dependent upon the nature of the diluent, being 4 volumes for sodium chlorid solution (0.3 per cent) and 7 volumes for water, either distilled or tap water.

"Softened water exerts an inhibitory influence, due principally to the presence of magnesium hydroxid.

"The fact that salivary amylase acts more efficiently when the saliva is diluted is an added argument in favor of water drinking with meals.

"The influence of dilution, as above set forth, aids in explaining the better digestion of ingested carbohydrates when accompanied by a copious water ingestion."

Contribution to the physiology of the intestine.—III, The absorption of mono and disaccharids, U. LOMBEROSO (*Arch. Farmacol. Sper. e Sci. Aff.*, 13 (1912), No. 12, pp. 547-566; *abs. in Zentbl. Expt. Med.*, 3 (1913), No. 6, pp. 277, 278).—Little difference was noted in the absorption of different monosaccharids in equivalent molecular solution. All were rapidly absorbed in the case of hypertonic solutions, but a hypotonic solution of glucose was absorbed much more slowly.

Differences were noted in the resorption in the small intestine of disaccharids, lactose being resorbed in smaller quantity than saccharose and maltose. The last two showed no constant differences. The resorption of glucose solutions in the small intestine is directly proportional to the time element, from which it follows that the absolute amount of the resorbed sugar constantly grows less since the greater part is resorbed in the first 15 minutes. No difference in the rate was noted between a resorption during fasting and during digestion. Experiments were made with dogs with intestinal fistulas.

The alkalinity of the pancreatic and intestinal juices of living dogs, F. AUERBACH and H. PICK (*Arb. K. Gsndhtsamt.*, 43 (1912), No. 2, pp. 155-186).—The examination of 3 samples of intestinal juice and 19 of pancreatic juice obtained from animals with permanent fistulas showed the alkalinity of these juices to be only about equal to that of a solution of sodium bicarbonate, and not nearly as great as that of a sodium carbonate solution.

The inorganic constituents of both fluids consisted chiefly of sodium bicarbonate and sodium chlorid, the bicarbonate predominating in the pancreatic and the chlorid in the intestinal fluid. Both juices had the same degree of alkalinity. The author suggests that experiments with pancreatic and intestinal ferments should be carried out in solutions of sodium bicarbonate, or, better still, in solutions of sodium bicarbonate containing free carbonic acid, in order to conform to natural conditions.

Experiences with duodenal and stool ferments in health and disease, B. B. CROHN (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 19 (1912), Sect. VIIId, pp. 73-82).—The variations in activity of the ferments in the duodenum as secreted normally were found to be within certain definite limits.

From a comparison with those of the activity of the ferments secreted under pathological conditions the author believes that the method described may be of use in diagnosis of diseases of the pancreas.

The effect of sodium chlorid and cold storage upon the activities of proteolytic enzymes, W. N. BERG (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 19 (1912), Sect. VIIId, pp. 25-27).—From a study of changes taking place in milk and butter kept in cold storage it was found that a temperature of 0° F. and a sodium chlorid content of 18 per cent would inhibit the action of a proteolytic enzyme if the amount of enzyme were small, but not if the amount of enzyme were large.

The utilization of individual proteins by man as influenced by repeated fasting, P. E. HOWE and P. B. HAWK (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 19 (1912), Sect. VIIId, pp. 145-147).—A study was made of the utilization of substances like meat, milk, gliadin, and

gluten, of which the nitrogenous part consists chiefly of a particular individual protein. After fasting for 2 days, the subject of the experiments was given a standard diet furnishing a normal amount of protein consisting of the particular food studied for 5 days. During the first 2 days of the period the amount of food was 50 per cent more than that given during the following 3 days.

All of the proteins were found to be more completely utilized during the period of high diet following the fasting period than during the 3 days of normal diet. Meat and glidin were observed to have the highest utilization values. During the periods of 5 days greater gains in nitrogen were made upon proteins of animal origin (milk and meat) than upon those of vegetable origin (gluten and glidin). That the utilization value of a food is not always a correct index of its efficiency is shown in the case of meat and glidin. As far as digestion and assimilation were concerned, they were equal in value, but meat yielded a gain in nitrogen of 11.3 gm. whereas glidin showed a loss of 1.3 gm. during the period of 5 days.

Fatty acid esters of glucose, W. R. BLOOR (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 19 (1912), Sect. VIIId, pp. 29-36*).—A preliminary report of the preparation of the glucose esters of lauric, butyric, and stearic acids, and of animal experimentation with them with a view of obtaining further knowledge regarding the relationship of fats and carbohydrates in metabolism.

The esters were found to be quite well utilized in the intestine in feeding experiments, but when injected into the peritoneal cavity and the veins they were injurious.

Comparative studies of the pharmacological effects of the organic compounds of sulphurous acid and of neutral sodium sulphite, II, E. ROST and F. FRANZ (*Arb. K. Gsndhtsamt., 43 (1912), No. 2, pp. 187-303, figs. 10*).—The authors review previous work published by them (*E. S. R., 16, p. 901*) and present the results of further experiments regarding the fate in the body of sulphurous acid, sulphites, and the organic compounds of sulphurous acid, their mode of action, and the theory of their poisonous effect.

After introduction into the body the compounds of sulphurous acid undergo such a rapid oxidation that the tracing of the individual steps in this change is impossible. Sulphites and the organic compounds of sulphurous acid are oxidized quickly to sulphates in which form they are excreted in the urine, and even after the introduction of large amounts of these substances into the body not more than 1 per cent of the material introduced could be recovered from the urine as sulphite even during the first 4-hour period after introduction. The effects of the sulphurous acid, its organic salts, and sulphites are the same and the poisonous action of the salts depends on the degree to which they are broken down into free sulphurous acid in the body. The theory of the poisonous action of these compounds was not accurately determined, but it did not resemble either the action of a typical reducing agent or of a true acid.

Unbalanced nutrition.—Fermentative processes in cereals and diseases arising from them, J. H. F. KOHLBRUGGE (*Sitzber. Naturhist. Ver. Preuss. Rheinlande u. Westfalens, 1911, Nos. 1, Sect. A, pp. 45, 46; 2, Sect. A, pp. 47-63*).—The author reports the results of experiments upon the bacterial fermentation of rice and its relation to beri-beri in fowls, which in his opinion indicate that beri-beri is probably due to bacterial fermentation of the large amounts of rice or other cereals eaten in unbalanced diets. The importance of bacterial fermentation in the intestine as a possible cause of a number of diseases arising from eating foods consisting almost entirely of carbohydrate is suggested, and the action of acids and acid-forming bacteria and the value of

foods which furnish acids as a means of preventing and curing these diseases are discussed at length.

Infantile beri-beri, V. L. ANDREWS (*Philippine Jour. Sci., Sect. B*, 7 (1912), No. 2, pp. 67-88, pls. 3).—According to the author's investigations, the high rate of infant mortality in Manila from beri-beri is due to a lack in the mother's milk of some constituent essential to the development and growth of the child's nerves. The disease is not due to an infection or toxemia of either mother or child.

Nutrition laboratory, F. G. BENEDICT (*Carnegie Inst. Washington Year Book*, 11 (1912), pp. 214-229).—An account is given of improvements in laboratory equipment, of apparatus under construction, and of the results of cooperative and other work which has been undertaken. Abstracts are presented of the publications which have appeared during the year (E. S. R., 27, pp. 666, 767, 768; 28, p. 213).

ANIMAL PRODUCTION.

Fodders and feeding stuffs, F. T. SHUTT (*Canada Expt. Farms Rpts.* 1912, pp. 146, 147, 148-155).—Analyses are reported of Chevalier, New Zealand, and Hannchen varieties of nonirrigated, spring, and fall-irrigated barley. An analysis of wood pea silage showed water 51.82, protein 8.23, fat 1.72, carbohydrates 19.20, fiber 15.18, and ash 3.84 per cent. Analyses of corn silage and clover silage are also reported.

Analyses are given of upland prairie hay, salt-marsh grass (*Spartina glabra*) a sedge (*Scirpus americanus*), a rush (*Juncus balticus*), redtop grass (*Agrostis alba*), and hay from an "alkali flat" (*Sporobolus depauperatus*).

The comparative composition of Gate Post and Giant Yellow Globe varieties of mangels is given for a number of years, showing the influence of heredity on the relative amount of sugar and dry matter in the mangel.

Analyses are reported of shorts, oat hulls, oat flour, flax by-products, cotton-seed meal, and miscellaneous commercial feeding stuffs.

Silos, silage, and silage crops for Hawaii, C. K. MCCLELLAND (*Hawaii Sta. Press Bul.* 40, pp. 30, figs. 4).—This is a summary of data as to the nutritive value of silage, the capacity and construction of silos, the crops for the silo, methods of filling silos, and the feeding of silage.

[Analyses of fern tree trunks and soy-bean cake], E. V. WILCOX (*Hawaii Sta. Rpt.* 1912, p. 63).—An analysis of the trunk of the fern tree (*Cibotium chamissoi*), a Hawaiian hog feed, showed a moisture content of 69.38, protein 1.12, sugars 4.23, starch 20.92, ash 0.33, and phosphoric acid 0.1 per cent.

An analysis of soy-bean cake is also reported, showing a sodium chlorid content of 23.05 per cent.

Fish meal as food for stock (*Live Stock Jour.* [London], 77 (1913), No. 2039, pp. 463, 464).—A short article on the use of fish meal in Germany and Scandinavia as a food for stock. It is said that it has been fed to dairy cows, fattening bullocks, and pigs with excellent results on their productive powers, and without tainting the milk, butter, or flesh. Cattle may be fed a daily allowance of from 2 to 2½ lbs., and pigs about ½ lb.

Concentrated commercial feeding stuffs, J. D. TURNER and H. D. SPEARS (*Kentucky Sta. Bul.* 170, pp. 65-161).—Continuing work previously noted (E. S. R., 26, p. 568), this reports the results of the state feed inspections in 1912, including the protein and fat content of the following feeds: Alfalfa meal, beef scrap, digester tankage, malt sprouts, dried beet pulp, buckwheat, corn bran, corn chop, cracked corn, corn meal, hominy meal, cotton-seed meal, linseed meal, wheat bran, middlings, ship stuff, shorts, mixed feeds, dried brewers' grains, chicken feeds, distillers' dried grains, and crushed ear corn.

An analysis of screenings gave the average percentage of grain as 26.06, of weed seeds 22.38, and of inert matter 51.56. It is estimated that a 100-lb. bag of feed containing 20 per cent screenings would contain $4\frac{1}{2}$ per cent of weed seeds. It was further found that recently grain screenings have been mixed with distillers' dried grains, a practice which has not been observed heretofore.

[Analyses of feeding stuffs], R. E. ROSE (*Fla. Quart. Bul. Dept. Agr.*, 23 (1913), No. 1, pp. 36, 37).—Analyses are reported of cotton-seed meal, wheat and corn by-products, cowpeas, velvet beans, gluten feed, beef scrap, and proprietary feeds.

Animal husbandry, W. S. COBSA ET AL. (*Bien. Rpt. Kans. Bd. Agr.*, 18 (1911-12), pp. 209-457, pls. 3, figs. 88).—A compilation of articles on live-stock raising, rations for horses, Percheron breeding, beef production, hog raising, and similar subjects previously noted from station bulletins.

Experiments with live stock, J. H. GRISDALE, J. A. CLARK, R. ROBERTSON, W. C. MCKILLICAN, W. H. FAIRFIELD, and G. H. HUTTON (*Canada Expt. Farms Rpts.* 1912, pp. 54-60, 244-247, 264, 265, 296-300, 380-384, 408, 409).—In continuation of work previously noted (*E. S. R.*, 27, p. 371), tests in feeding Shorthorn and Angus steers various proportions of bran, gluten meal, oil cake, clover hay, corn silage, turnips, mangels, oat straw, and roots are reported. Four lots of 15 steers made an average daily gain, for 350 days, ranging from 1.12 to 1.82 lbs., at costs ranging from 7.1 to 14.6 cts. per pound.

In a test to determine the feeding value of straw as a roughage, a carload of 2 and 3-year-old steers were fed 155 days. The average profit per head realized, after paying for all feed, was \$15.56.

As a result of experiments in steer feeding it is calculated that "an increase in selling price over buying price of from 1 to $1\frac{1}{4}$ cts. per pound is required to cover a 4 to 6 months' feeding period."

In a comparison of feeding steers outside with feeding in stable, twenty-one 3-year-old steers, chiefly Shorthorn and Hereford grades, were winter-fed $5\frac{1}{2}$ months. Lot 1, fed outside and amply supplied with hay and straw, together with a grain ration, made an average daily gain per head of 1.28 lbs., costing 9.6 cts. per pound. Lot 2, fed in the stable and receiving straw, corn silage, and roots in addition to the regular grain ration, made a corresponding gain of 1.34 lbs., costing 8.9 cts. per pound. Lot 3, also fed in the stable and similarly to lot 2 except that 3 lbs. of the grain ration was replaced by 3 lbs. of alfalfa hay a part of the period, made a corresponding gain of 1.29 lbs. at a cost of 8.4 cts. Although slightly greater gains accrued from stalling and grain feeding, the results show the profits possible from a better use of straw and coarse grains for fattening steers, indicate that stalling is not essential, and give proof of the great feeding value of alfalfa.

In experiments in fattening lambs the value of roots and corn silage as a succulent feed was determined. Three lots of 10 each were fed 114 days. The average daily gains per head were for the lot receiving turnips 0.28 lb., the lot receiving silage 0.27 lb., and the lot receiving turnips and silage 1:1, 0.3 lb. The respective costs per pound of gain were 8.04, 7.66, and 7.55 cts.

Results indicate "corn silage to be of high value for fattening lambs, the average net profit per lamb covering 3 years' experiments being \$1.28 for the turnip-fed lots as against \$1.57 for the lots getting silage, and \$1.34 for the lots on a mixture of turnips and silage."

In a 90-day test with 30 lambs to determine the value of roughage in fattening, results were as follows: Lot 1, fed on alfalfa and clover hay in addition to the regular grain ration, produced an average daily gain of 0.17 lb. per head.

Lot 2, fed mixed hay (80 per cent timothy) and corn stover ad libitum, gave a corresponding gain of 0.085 lb., and lot 3, fed timothy hay and turnips ad libitum, one of 0.09 lb. The respective costs per pound of gain were 9.05, 18.6, and 14.75 cts.

An experiment was carried on to determine the relative value of alfalfa when fed alone and in different combinations with roots and grains. Five lots of 50 wethers each were fed 112 days. Lot 2, receiving alfalfa and screenings, showed the greatest profit, \$1.58 per lamb; lot 4, receiving alfalfa and roots with a grain ration the last 6 weeks, showed the second largest profit, \$1.42 per lamb; lot 5, receiving alfalfa alone, with a grain ration the last 6 weeks, stood third as a profit producer, making \$1.31 per lamb; lot 3, on alfalfa roots and mixed grains, produced \$1.23; and lot 1, on alfalfa and mixed grains made \$1.20 per lamb.

A test was made with 5 lots of 5 pigs each for 56 days to determine the relative value in pig feeding of a ration of a mixture of ground barley, shorts, and ground oats 2:2:1, and supplemented by turnips, as compared with the meal alone and with skim milk. In this test, on the meal and milk ration there was produced an average daily gain per head of 0.87 lb. at a cost of 3.8 cts. per pound. The corresponding gains for the meal and pulped turnips, cooked, were 0.58 lb., at a cost of 4.7 cts. per pound; the meal and pulped turnips, raw, 0.42 lb. at a cost of 4.9 cts. per pound; the lot fed on meal and pulped mangels, raw, 0.65 lb., costing 5.1 cts. per pound; and meal and water, 0.72 lb. at 5.1 cts. These experiments indicate the great value of skim milk for fattening hogs.

In sheep feeding experiments to determine the best means of disposing of by-products of wheat farms, 4 lots of western range sheep were fed 126 days on wheat screenings and different kinds of roughage. Lot 1, fed hay in the stable, made an average daily gain of 0.14 lb. per head; lot 2, on alfalfa outside, 0.29 lb.; lot 3, on hay outside, 0.12 lb., and lot 4 on straw outside 0.12 lb. The costs per pound of gain were 10.7, 9.6, 17.7, and 10.1 cts., respectively. "The striking result of this experiment is the much greater gains made by the sheep fed on alfalfa than those on hay."

Feeding for beef in central Alberta, G. H. HUTTON (*Canada Expt. Farms Bul. 12, 2. ser., 1912, pp. 13, pls. 4*).—This summarizes the steer-feeding tests at the Lacombe Experimental Station, Alberta, during the years 1909–1912, most of which have been previously noted from other sources (*E. S. R.*, 27, p. 372; 29, p. 271).

As a result of the work it is concluded that low-grade grains may be made to bring the producer a higher price per bushel sold through steers than will high-grade grains sold through the elevators. The 3-year-old steers seem better adapted for straight wheat feeding than the 2-year-old steers. The breeder is recommended to feed his steers and market them in a finished condition.

Report of the animal industrialist, J. M. SCOTT (*Florida Sta. Rpt. 1912, pp. XXI–XXXI*).—In addition to work previously noted (*E. S. R.*, 27, pp. 373, 672), a report is given on 2 steers fed 89 days on a ration of corn and cotton-seed meal 3:1, with Japanese cane for forage, which made an average daily gain of 1.68 lbs. Data are also reported regarding the milk production of the station dairy herd, food consumption, body weights, etc.

Cattle feeding experiments with coconut cake, wheat bran, and linseed cake, W. BRUCE (*Edinb. and East of Scot. Col. Agr. Rpt. 27, 1912, pp. 17*).—Results are reported of the feeding of 42 head of 2-year-old bullocks for 4 and 5 months on special feeds of coconut cake, wheat bran, and linseed cake, together with a daily basal ration of 4 lbs. Bombay cotton cake, 90 lbs. swedes, and 12 lbs. oat straw.

The lots receiving linseed cake made an average daily gain of 2.25 lbs. per head and produced a gross profit of £39 6d.; lots receiving coconut cake, a corresponding gain of 1.91 lbs. and gross profit of £35 7s. 5d.; and lots receiving the bran a gain of 2.02 lbs. and a gross profit of £40 7s. 3d. The relative values of these several feeding stuffs, based on the results of the experiment, are estimated.

Notes on cattle breeding, R. C. SIMMONS (*Rhodesia Agr. Jour.*, 10 (1913), No. 4, pp. 519-528, pls. 5).—This is a discussion of the breed characteristics of the Sussex, Hereford, North Devon, Aberdeen Angus, and Africander breeds of cattle, and their general adaptability to the State of Rhodesia.

Prospects for importation of cattle from Australia, E. A. NOBBS (*Rhodesia Agr. Jour.*, 10 (1913), No. 4, pp. 489-512, pls. 9).—This includes a report of investigations made of the live-stock conditions in the several provinces of Australia, and discusses the inadvisability of making importations therefrom.

Rambouillet sheep in France, J. ASHTON (*Breeder's Gaz.*, 63 (1913), No. 14, pp. 836, 837, figs. 3).—An article dealing with the foundation, improvement, and history of the world-famous flock at Rambouillet, France, produced as the result of a very intensive and continuous inbreeding of the Spanish Merino. It is claimed that because of this intensive inbreeding the rams are very potent and are being sold as foundation stock to French and South African buyers.

A record has been kept of the breeding and weights of each individual in the flock, showing an increase from 1794 to 1910 of 33 per cent in live weight and of 200 per cent in wool production. Three families with the same general qualities but differing in the wool folds about the neck, brisket, and legs have been established. The weights of fleeces mentioned range from 15.5 to 16 lbs. for ewes and from 23.7 to 35.8 lbs. for rams.

Horse breeding, A. W. ANSTRUTHER (*Bd. Agr. and Fisheries [London]. Horse Breeding, 1911-12*, pp. 52).—A report of the progress made in the British Isles during 1911-12 in the encouragement and improvement of the light horse breeding industry.

Report of the poultry manager, A. G. GILBERT (*Canada Expt. Farms Rpts. 1912*, pp. 217-230).—This report discusses various phases of the marketing problem, the practical management of poultry for profits, and the securing of a suitable market type of chicken. and gives notes on the work under way at the station. An investigation into poultry diseases indicates that "2 diseases, viz. blackhead in turkeys and tuberculosis among fowls, are the most widespread and fatal, and are creating much havoc among the poultry of the country."

Methods of chick feeding, CLARA NIXON (*New York Cornell Sta. Bul. 327*, pp. 229-273, figs. 22).—This is a continuation of work begun in 1909 (E. S. R., 24, p. 272). This experiment differed from that in 1909 in that the rearing period was extended 2 weeks and the fattening period lessened 2 weeks. The mash used in the earlier experiment was composed of the cracked corn mixture, finely ground and mixed with a proportion of bran; that used in the later experiment was made up of corn meal, by-products of wheat, and beef scrap.

The average gains made and the cost of feeding chicks the first 8 weeks are summarized in the following table:

Average gains and cost of feeding chicks the first 8 weeks by different methods (1910).

Ration.	Number in fattening experiment.	Number at end of 8 weeks.	Average weight of chicks at end of 8 weeks.	Total amount of food consumed.	Total cost of food consumed.	Total cost of labor.
			<i>Pound.</i>	<i>Pounds.</i>		
Cracked grain and beef scrap.....	100	81	0.481	159.50	\$3.058	\$1.945
Cracked grain, dry mash, and beef scrap...	100	89	.639	206.31	3.877	2.101
Cracked grain, wet mash (granulated milk), and beef scrap.....	100	83	.700	241.91	4.604	2.757
Cracked grain, wet mash (skimmed milk), and beef scrap.....	100	91	.706	263.45	4.330	2.757
Wet mash (granulated milk) and beef scrap	100	11	.660	172.85	3.270	3.075
Specialty ration.....	100	84	.639	236.47	4.141	2.501
Variety ration.....	100	75	.546	204.55	3.865	2.704

"(1) Chicks appeared to need both cracked and ground food. (2) Chicks grew more rapidly on moistened mash than on dry mash, other conditions being equal. (3) Chicks fed from the first on dry mash and grain were nearly as large at the end of 8 weeks as those that had been started on a moist mash and later changed to dry mash. (4) Skim milk mash produced growth on less food per pound gain in weight than did dry mash. (5) Chicks that were given hopper-fed beef scrap from the first, in connection with cracked grain and ground food, made better growth than those started on a limited amount of beef scrap. (6) Chicks given a limited amount of beef scrap for the first 3 weeks grew better than those whose meat food was given in the form of eggs. (7) No ill effect was observed when beef scrap was hopper-fed from the first meal, if given in connection with a well-balanced ration. (8) When the other food given did not supply their needs, chicks ate sufficient beef scrap to cause high mortality from digestive ailments. (9) Sour skim milk proved of value for chick-feeding. (10) Sour skim milk fed in a moistened mash gave better results than granulated milk fed under the same circumstances."

The gains made and the cost of feeding the same chicks during a 4 weeks' fattening period which followed are summarized in the table given below:

Average gains and cost of fattening 8 weeks' old chicks for 4 weeks by different methods.

Ration.	Number in experiment.	Number of deaths in 4 weeks.	Average weight of chicks marketed.	Total amount of food consumed.	Total cost of food consumed.	Total cost of labor.
			<i>Pounds.</i>	<i>Pounds.</i>		
Cracked grain and beef scrap.....	81	2	1.090	232.37	\$2.338	\$1.512
Cracked grain, dry mash, and beef scrap...	89	0	1.116	188.23	1.890	1.512
Cracked grain, wet mash (granulated milk), and beef scrap.....	83	0	1.170	171.94	1.773	1.512
Cracked grain, wet mash (skimmed milk), and beef scrap.....	91	0	1.163	187.82	1.883	1.512
Wet mash (granulated milk) and beef scrap	11	0	1.045	27.14	0.287	1.512
Variety ration.....	75	2	1.107	200.54	2.103	1.512
Specialty ration.....	84	1	1.134	193.29	1.958	1.512

The experiments as a whole indicated that the feeding of both cracked and ground grain was more desirable than the feeding of either alone. For the

entire feeding period of 12 weeks, the cost, including all items, amounted to 25.8 cts. per chick for all flocks; the average returns were 21.1 cts. per chick, making a loss on the experiment of 4.7 cts. per chick.

Report of the poultry expert, D. F. LAURIE (*Rpt. Dept. Agr. So. Aust., 1911, 49-68*).—This report includes a summary of the results of egg-laying competitions concluded on March 31, 1911.

In experiments on the occurrence of broodiness in Leghorns, 47 pens out of 61 pens recorded finished the year with less than 6 cases of broodiness, indicating that this character is being almost eliminated in the breed. In an experiment to test the practicability of systematic fattening of table poultry, 25 birds were crammed 17 days, with resulting average increase of from 6 oz. to 2 lbs. 1 oz., with an average cost of food during the period of 2.73 d. per bird. In a feeding test of 12 months with 8 pens of 10 White Leghorn pullets each, the largest egg record (1,317 eggs) resulted from a ration of mash, oat flour, wheat, bran, meat meal, green feed, and oats in litter.

A series of tests was conducted to ascertain the relative weights of eggs of the light and heavy breeds, 24 oz. per dozen eggs being established as a standard. One pen of Brown Leghorns and 6 pens of White Leghorns failed to reach the weight prescribed, while 7 pens just reached it. Among the heavy breeds, of the 14 pens of Black Orpingtons only one fell short, with 22½ oz., the highest weight being 26½ oz. When the eggs of 61 pens of birds of the light breeds and 28 pens of the heavy breeds were weighed 3½ months after the first test, in both cases the general results showed a fall in the average weight during the period, this tending to disprove the theory that the pullet that lays a small egg will develop the habit of laying eggs of larger size. A table is included giving data on the monthly egg production and average weight of eggs of 3 White Leghorns and 3 Black Orpingtons, which illustrates the periodical increase and decrease in size of eggs.

The average weight of 48 representative eggs of the various breeds of fowls are given for Black Orpingtons, Buff Orpingtons, Plymouth Rocks, Silver Wyandottes, White Leghorns, and Indian Games. These weights range from 2 to 2.35 oz. per egg. Data on the weight and measurement of eggs, thickness and weight of shell, and the color and appearance of the shell of eggs of the various breeds of fowls are included.

The following table shows the results of experiments carried on to determine the effect of various degrees of moisture and ventilation in artificial incubation on the percentage of hatch:

Effect of moisture and ventilation in artificial incubation.

Amount of moisture and ventilation supplied.		Fertile eggs.	Chicks hatched.	Chicks dead in shell.	Chickens deformed or weak.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Half moisture.	Vents closed first week, then gradually opened.	83.33	52.00	48.00	11.5
Full moisture.	Vents closed first week, then gradually opened.	86.66	47.86	52.14	7.1
Full moisture.	.....	87.50	52.38	47.72	12.7
No moisture.	Vents closed first week, then opened.	65.07	56.09	43.91	52.1
No moisture.	Vents open.	54.13	50.00	50.00	33.0
Half moisture.	Vents closed.	69.11	67.02	32.98	.....
Half moisture.	Vents open.	71.00	64.78	35.22	39.1

In a series of tests with 2 lots of eggs, both white-shelled, placed in hot air and in hot water incubators, the data show that the evaporation during the second period of 6 days was less than during either the first or third period. In the hot-air machine for a period of 18 days, the average loss in weight per

egg due to evaporation was 15.78 per cent, as compared with 14.94 per cent in the case of the hot-water machine. In another test the average loss in weight due to evaporation was 17.13 per cent per egg as compared with 15.81 per cent loss with brown-shelled eggs. "The results all along point to the fact that the structure of the brown shells differs somewhat from that of the white shells."

In tests to determine the effect of cold storage on evaporation in eggs, the average percentage of loss of moisture was 7.78 in the case of small eggs and 7.703 with large eggs, but the difference in favor of the large egg is considered unimportant. The low percentage of evaporation is attributed to 2 factors (1) the eggs were kept at an almost uniform temperature of 0° C., and (2) the moisture content of the atmosphere was from 75 to 78 per cent.

Poultry [records], R. S. SETON (*Yorkshire Council Agr. Ed. and Univ. Leeds [Pamphlet] 85, 1912, pp. 39, 40*).—This is a report of egg-laying records during a period from 1907 to 1911 of hens and pullets of the following breeds: Scotch Grey, Faverolles, White Leghorn, Buff Orpington, and Silver Wyandotte.

The care of the farm eggs, H. M. LAMON and C. L. OPPERMAN (*U. S. Dept. Agr., Bur. Animal Indus. Bul. 160, pp. 53, pls. 6, figs. 8*).—This continuation of work previously reported (*E. S. R., 26, p. 78*) treats of the deterioration occurring in the various classes of fertile and infertile eggs when kept on the farm under different environmental conditions, and includes extensive experimental egg work carried on in Kansas.

Results of these tests indicated that the cyclone cellar is to be preferred as a storage for eggs to other average farm conditions. The unheated room in the dwelling house is not conducive to good quality in eggs, while eggs left during the hot summer months in nests in the straw stack, weeds, under the corn crib, and in stolen nests were badly affected with spots, blood rings, and rot. Nests for layers and stolen nests were especially conducive to deterioration in fertile eggs. The straw stack was the only test in which a large number of infertile eggs deteriorated to such an extent as to be unfit for food.

"In fertile eggs the development of the embryo after 24 hours of incubation was of sufficient proportion to be recognized when held before the candle, and at the expiration of 36 hours the presence of blood was easily detected. In infertile eggs under the same conditions a slight shrinkage of the contents was the only change which could be recognized by the eye. Infertile eggs, regardless of where they may be kept, are much more resistant to deterioration than fertile. Two-thirds of the total loss in fertile and infertile eggs takes place on the farm. The basic factors responsible for this condition are the haphazard methods of poultry management on the farm. If eggs are fresh when delivered to the buyer it is impossible, with the present methods of transportation, for them to reach the packing house without showing a slight deterioration in quality. The data at hand would indicate that this loss is about 12 per cent of the original value of the eggs. The results of all the experimental work point to the fact that the production of the infertile egg is the greatest asset in the attempt to produce high-quality market eggs during hot weather."

Farm poultry, FRANCES WILLEY ET AL. (*Bien. Rpt. Kans. Bd. Agr., 18 (1911-12), pp. 459-712, figs. 31*).—A compilation of articles on poultry diseases, choice of breeds, poultry management, and other related subjects.

DAIRY FARMING—DAIRYING.

[Feeding dairy cows and calves], J. J. HOOPER (*Kentucky Sta. Bul. 171, pp. 165-190, figs. 4*).—Part 1 of this bulletin, *Feeding Dairy Cows in Kentucky* (pp. 165-182), discusses the feeding of balanced rations, the purpose of nutrients in milk production, the value of the different dairy feeds, including both

concentrates and roughages, and the desirability of variety in the dairy ration, and presents a number of grain mixtures. Part 2, Experiments in Feeding Dairy Cows and Calves (pp. 183-190), reports experiments carried on at the station.

Eighty calves (principally Jerseys) were employed in 5 separate experiments to determine the advisability of using 3 kinds of calf nipples for feeding the young calf. "It required on an average for all the calves, $39\frac{1}{2}$ seconds for the bucket-fed calves to drink their milk, while the calves sucking their milk through the nipple required an average of 2 minutes and 21 seconds to drink the same quantity of milk. Our weights show conclusively that during the first 7 to 10 weeks of the calf's life, they were more thrifty when fed through the nipple, which was due to the fact that as they suck the milk they mix it thoroughly with saliva and take it slowly. After the seventieth day the nipple was no more effective than bucket feeding."

The results of an experiment made to determine whether or not the milk from Kerry cows would nourish Jersey calves better than Jersey milk were inconclusive, and the experiment will be repeated.

An experiment was made with 18 grade and pure-bred Jersey calves to test the relative efficiency of corn, flaxseed, and whole milk. The average daily gains for the 3 lots were, respectively, 1.44 lbs., 1.26 lbs., and 1.38 lbs., and indicate that it is unnecessary to use high priced whole milk, or to purchase expensive oil-bearing seeds such as flaxseed, to supplement skim milk for calves that are 2 months old.

Three lots of 6 calves each were fed 79 days to determine if as good calves could be grown on skim milk and on rolled oats as on whole milk. The average daily gains were for the calves fed on whole milk 0.84 lb., those on skim milk 0.88 lb., and those on rolled oats and skim milk 0.465 lb., with the respective total costs of feed \$31.60, \$14.03, and \$5.42. These results indicate the value of skim milk supplemented with some grain as the calf attains the age of from 6 to 8 weeks.

Experiments in the summer feeding of dairy cows, though not conclusive, indicated that a small grain ration to supplement pasturage or silage was profitable.

On the effect of heavy root feeding on the yield and composition of milk, A. LAUDER and T. W. FAGAN (*Edinb. and East of Scot. Col. Agr. Rpt.* 26, 1912, pp. 56).—A report of experiments with 60 dairy Shorthorns extending over a period of 3 years. The "turnip ration" consisted of 4 lbs. concentrates, 112 lbs. turnips, and 15 lbs. hay, while the "ordinary concentrated ration" was made up of 10 lbs. concentrates, 40 lbs. turnips, and 15 lbs. hay. The results obtained indicate that "the feeding of a ration containing a large quantity of water does not increase the percentage of water in the milk or reduce the percentage of fat. The greater yield of milk was obtained from the cows on the concentrated ration. On the other hand, the milk from the cows on the turnip ration contained a higher percentage of fat, and a greater total weight of fat was secreted in the milk. The cost of production, when allowance was made for the percentage of fat in the milk, was less in the case of the turnip ration."

On the feeding value of legumes for milk production, N. HANSSON (*Meddel. Centralanst. Försöksv. Jordbruksområdet*, 1912, No. 66, pp. 29).—Feeding experiments with milch cows were conducted by the author during 3 winter periods, 1910-1912, on 3 Swedish dairy farms, from 18 to 30 milch cows being included in each experiment. The influence of replacing 2 kg. of a mixture consisting of from 40 to 50 per cent of peanut cake and 50 to 60 per cent wheat bran, with

a similar amount of ground peas, beans, or vetches, was studied in the experiments.

The substitution resulted in an average loss of 0.14 lb. of milk per head daily for the pea and vetch lots, and 0.5 lb. for the bean lot. The body weights of the cows in the last lot were increased somewhat, and a slight increase also took place in the case of the lots fed peas and vetches.

Influence of legumes on the quality of butter, L. R. ROSENGREN (*Meddel. Centralanst. Försöksv. Jordbruksområdet, 1912, No. 70, pp. 6*).—The butter produced in the experiments of Hansson, noted above, was scored according to quality and compared with that from control lots. The results obtained led to the conclusion that these legumes do not have any deleterious effect on the quality of butter produced on otherwise normally composed feed rations, but may be considered similar to common oil cakes in their influence on the quality of the butter.

Cost of food in the production of milk, C. CROWTHER (*Univ. Leeds and Yorkshire Council Agr. Ed. [Pamphlet], 86, 1913, pp. 27*).—This bulletin reports record tests of 95 cows for a period of 12 months to determine the cost of food in the production of milk. It includes data on the rations fed, cost of rations, the range of variation in the percentage of fat, variation in milk yield, and other data pertaining to this subject.

[Dairy herd records], J. H. GRIDDALE and P. H. MOORE (*Canada Expt. Farms Rpts. 1912, pp. 51-53, 423, 424*).—Tables are given, showing the milk record and feed consumption of the main station herd, also of the first lactation period of 28 grade Holstein cows after a long train trip and before being acclimatized.

English Guernsey cattle society's milk records (*Mark Lane Express, 109 (1913), No. 4256, p. 587*).—A report of the milk records of 51 Guernsey cattle, including yield of milk and milk fat, percentage of milk fat, etc.

Danish milk control, J. J. DUNNE (*Hoard's Dairyman, 45 (1913), No. 17, pp. 624, 633, figs. 2*).—The author discusses the extension of the Danish milk control scheme and presents a table giving a survey of the results of various control unions throughout Denmark for the past 8 years. The increase in percentage of milk fat, in pounds of butter, and in quantity of milk produced has been quite marked.

On the nature of the cellular elements present in milk.—IV, The histological appearances of the udder, R. T. HEWLETT, S. VILLAR, and C. REVIS (*Jour. Hyg. [Cambridge], 13 (1913), No. 1, pp. 87-92, pl. 1*).—In continuation of earlier work (E. S. R., 25, p. 480), this report deals with the histological appearances of the udder and a determination of the nature and source of the cellular elements in milk.

"This examination of these several udders has shown the extreme paucity of polymorphonuclear leucocytes in the inter-alveolar tissue, and so far as can be seen their complete absence in the lumina of the alveoli. In the subepithelial layer, cells corresponding to the 'germinal' cells of Winkler have been detected and lend support to his conclusions respecting the origin of the epithelium from these cells. . . . The results of this examination confirm the opinion we have already expressed that the cellular elements found in milk, either normally or in ordinary catarrhal or interstitial nonsuppurative mastitis are tissue cells, and that 'pus cells' in the ordinary acceptance of the term, do not appear in milk under these conditions."

Milk analysis, A. PAPPEL (*Cairo Sci. Jour., 7 (1913), No. 78, pp. 63-67*).—Analyses of 14 samples of buffalo milk are reported, and the methods of analysis discussed.

On the fat content of human milk, W. ARNOLD (*Ztschr. Untersuch. Nahr. u. Genussmitl., 23 (1912), No. 9, pp. 433-440; abs. in Hyg. Rundschau, 23 (1913),*

No. 9, p. 554).—This includes an analysis of the various fatty acids found in human milk and a comparison with cow's milk.

A study of the udder flora of cows, H. A. HARDING and J. K. WILSON (*New York State Sta. Tech. Bul.* 27, pp. 3-40).—This is a study of the quantitative relationships of the bacterial flora of 1,274 samples of milk and the qualitative relationships of about 900 samples. The samples were carefully milked into sterile test tubes and exposed to a minimum amount of contamination.

"Bacteria were most abundant in the first few streams of foremilk, were distinctly less abundant during the main portion of the milking, and again became more abundant in the strippings. The germ content was found to be unequally distributed in the udder, the back quarters having about 3 times as many germs per cubic centimeter as the fore quarters. The average of 1,230 samples was 428 per cubic centimeter. The connection between the period of lactation and the germ content was not very marked. The colostrum showed a slightly higher and the milk of the twelfth month a slightly lower content than the intervening periods. The age of the cow likewise was not found to exert any appreciable effect upon the germ content of the udder. The kinds of organisms present in over 900 samples of milk were studied and 71 groups described as members of the udder flora. No organisms producing spores and no motile forms were found. Seventy-five per cent of the forms were micrococci but only 2 streptococci were isolated. The need of free oxygen was so great that 80 per cent of the forms were not able to produce turbidity in the closed arm of the fermentation tube. Gelatin was liquefied by 55 per cent of the forms and digestion of milk was evident in cultures of about one-half of these forms, the remainder probably liquefying too slowly to be determined by this comparatively crude method. No gas was formed in fermentation tubes in the presence of dextrose, lactose, saccharose, or glycerin but acid was formed in percentages varying from 89 to 21 per cent of the forms with the different sugars. Nitrates were reduced by 59 per cent of the forms and starch was attacked by 20 per cent. The Gram stain was positive with 96 per cent."

Studies of long staffs forms of lactic acid bacteria (*lactobacilli*), C. BARTHEL (*K. Landtbr. Akad. Handl. och Tidskr.*, 51 (1912), No. 7-8, pp. 559-583; *Meddel. Centralanst. Försöksv. Jordbruksområdet*, 1912, No. 68, pp. 27, pls. 2, figs. 9).—Studies are described of the bacterial flora of different cultures of yoghurt, of samples of milk, and of 2 pure cultures of *Bacterium casei* obtained from von Freudenreich and Burri, in 1903 and 1911, respectively.

Some factors affecting the bacteriological content of milk, A. LAUDER and A. CUNNINGHAM (*Edinb. and East of Scot. Col. Agr. Rpt.* 28, 1913, pp. 17, pls. 3).—This is a report of experiments to determine the various factors which influence the bacterial content of milk. The milk was carefully drawn to preclude infection by outside agencies, "samples taken in sterile glass bottles by means of sterile copper dippers, and as a rule the determinations were commenced immediately." The diluted sample was mixed with sterile agar medium, poured into a sterile Petri dish, and incubated at 22° C. for 72 hours.

The bacterial content of the milk was materially lessened by grooming and washing the udder. In another test it was determined that feeding and grooming cows, or the removal of manure from the barn during the time of milking, greatly increased the bacterial content of the air and hence that of the milk. Immediate cooling of milk to the temperature of the air greatly retarded bacterial growth. In an effort to set a bacteriological standard for clean milk 53 samples from the herd at Bangour were examined and showed an average bacterial content of 47,906 bacteria per cubic centimeter of milk. Orr has previously suggested that clean milk, as it leaves the barn, should not contain more than 50,000 bacteria per cubic centimeter.

The milk supply of the city of Milwaukee and its control by the health department, S. M. GUNN (*Milwaukee Bur. Econ. and Efficiency Bul.* 13, 1912, pp. 48, pls. 2).—A report of investigations of the Milwaukee milk committee. This includes data on the wholesale and retail milk supply, sanitary condition of milk plants, scoring of dairy farms, bacteriological condition of milk, and other items of direct importance to the welfare of the city.

Sterilization of milk and butter, A. GAUTIER (*Rev. Electrochim. et Electrométal.*, 7 (1913), No. 3, pp. 59, 60).—A description of an electrical method of sterilization of milk and butter, for which the advantages are claimed of cheapness, convenience, and effectiveness.

Report of dairy expert, P. H. SUTER (*Rpt. Dept. Agr. So. Aust.*, 1911, pp. 43-48).—A report of butter and cheese manufacture and sale in this State, and of examinations of numerous samples of butter for export purposes.

The most serious defect found was staleness of flavor as a result of over-ripening of the cream. Of 387 samples tested for moisture the highest water content was 20.8 per cent, the lowest 8 per cent, and the average 11.85 per cent.

There follows a discussion of the value of testing and grading the dairy herd and of the operations under way at the Turretfield dairy and stud farm.

[Ferment serum], G. FASCETTI (*Indus. Latt. e Zootec.*, 11 (1913), Nos. 7, p. 101; 8, pp. 116, 117, 133, figs. 4).—This is an extended article on the various phases of the preparation and use of ferment serum for cheese making. It includes a discussion of the selection of the lactic ferment, the preparation and keeping of the serum, its degree of acidity, the quantity to use, and other related subjects.

VETERINARY MEDICINE.

Stock poisoning due to scarcity of food, C. D. MARSH (*U. S. Dept. Agr., Farmers' Bul.* 536, pp. 4).—This calls attention to the fact that stock seldom eat poisonous plants except when compelled by the scarcity of other feed. It emphasizes the fact that stock should not be turned out upon the range where there is little to eat except poisonous plants and that they should be kept away from areas definitely known to be infested with such plants. When stock are trailed from one place to another, they should so far as possible be driven through a country with plenty of good feed, or care should be taken to see that they are well fed before a drive is made through infested territory.

Larkspur, or "poison weed," C. D. MARSH, A. B. CLAWSON, and H. MARSH (*U. S. Dept. Agr., Farmers' Bul.* 531, pp. 15, figs. 5).—This is a brief account of the most practical results of investigations, a preliminary account of which has been previously noted (*E. S. R.*, 27, p. 180), and a detailed report of which is forthcoming.

With the exception of the loco weeds there is probably no poisonous plant on cattle ranges of the West that has caused such heavy losses to stockmen as has larkspur. It is pointed out that as the losses occur almost entirely in the months of May and June, though some may occur in the early part of July, poisoning can be largely prevented by keeping cattle away from the poison areas until about the end of the first week in July, when the plant disappears. Horses and sheep are not injured by grazing on larkspur areas. Many of the cases in which poisoning is not severe will recover if care is taken to turn the animal after it falls so that the head will be higher than the rest of the body, and to see that it is not further disturbed. Any attempt to get the animal upon its feet or to drive it rapidly is almost certain to be followed by fatal consequences. "If the animal bloats badly it should be relieved by paunching, that is, thrusting a trocar into the rumen in the manner which is practiced by so

many of the stockmen of the West. It is not clear that bleeding produces any good effects.

"When the animal is very weak, subcutaneous injections of 20 cc. (6 drams) of whisky will aid in bridging over the period of weakness and sometimes save the animal. In all cases it was found in the station work that beneficial results were obtained by using a subcutaneous injection of the following formula: Physostigmin salicylate 1 grain, pilocarpin hydrochlorid 2 grains, and strychnin sulphate $\frac{1}{2}$ grain." This formula applies to animals weighing 500 or 600 lbs., and double the amount should be given to a steer or cow of 1,000 lbs. or more.

Field horsetail (*Equisetum arvense*), H. T. GÜSSOW (*Canada Expt. Farms Rpts.* 1912, pp. 210, 211).—*Equisetum palustre* has long been suspected of being a fatal poisonous plant and the most recent investigations confirm this conclusion. The author's experience with the common field horsetail (*E. arvense*), concerning the poisonous effect of which there has been a divided opinion, has been that cattle do not suffer any inconvenience at all from this weed, or only very slight disturbance of their digestive organs, while horses are conspicuously subject to fatal poisoning by it. An examination of the hay upon which a considerable number of poisoned horses were fed revealed in every case the presence of *E. arvense*. As soon as the feed was changed, the horses, if not too seriously affected, made a rapid recovery.

Treatment consists of a liberal allowance of clean, easily digestible food, and the administration of a sharp purgative, followed by 2 teaspoonfuls of nuxvomica 3 times a day.

A new procedure for diagnosing infections with the Preisz-Nocard bacillus, P. FORGEOT and E. CESARI (*Ann. Inst. Pasteur*, 26 (1912), No. 2, pp. 102-105; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 5 (1912), No. 9, p. 159; *Rev. Gén. Méd. Vét.*, 21 (1913), No. 242, pp. 78, 79).—The serum from 13 horses which were chronically infected with the Preisz-Nocard bacillus was antitoxic enough to prevent the death of animals which were treated with the homologous toxin. The local changes in the disease were almost entirely suppressed.

Of the 13 horses examined 9 had latent lesions (kidney abscesses) which could not be detected by other methods.

Diagnosing anthrax with bone marrow, F. WULFF (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 12 (1912), No. 3, pp. 266-294).—This is a more detailed account of work previously noted (*E. S. R.*, 27, p. 781). The metacarpus or metatarsus having the phalanx prima digiti tertii attached is deemed the best pathologic specimen to send to the laboratory for diagnostic purposes.

A contribution to the study of epizootic abortion in the mare, C. DASSONVILLE and C. RIVIÈRE (*Rev. Gén. Méd. Vét.*, 21 (1913), Nos. 245, pp. 237-252; 246, pp. 301-322, figs. 8; *abs. in Jour. Compar. Path. and Ther.*, 26 (1913), No. 1, pp. 82-87).—While the observations of a number of authors indicate that joint-ill in foals is due to contamination of the umbilical cord, the present authors point out that it is not uncommon to find suppuration of the cord and joints in spite of the precautions taken.

In 3 cases studied they have been able to find a particular bacillus in a state of purity in the membranes, in the blood, and in all the tissues of each of the fetuses. The bacillus found in pure culture in a foal affected with joint-ill and in the 3 fetuses was very pathogenic for all the laboratory animals, and also caused abortion on every occasion when it was used for the inoculation of pregnant rabbits, guinea pigs, and mice.

The authors have also been able to produce abortion with filtered cultures, and further have been able to isolate by chemical means from the filtrates substances capable of producing abortion. The organism is very different from Bang's bacillus and from that reported by Smith and Kilborne to be the cause

of abortion in mares. It is a facultative anaerobe; broth becomes uniformly turbid in about 6 hours, and a characteristic growth is obtained on agar. It is Gram positive, but not equally so under all conditions, is motile, and very polymorphic. It possesses great vitality, a culture kept at laboratory temperature having remained viable for 7 months.

The conclusions drawn from the studies here reported are as follows: "An infection of the uterus of mares which occurs as an epizootic appears in some cases to lead to premature birth, and in other cases to cause serious lesions in foals which are carried to full term. The organism described appears to be the cause of the condition. In default of proof furnished by experiment upon mares, certain important points are brought forward, viz, its constant presence in pure culture in all the cases examined; the abortion produced experimentally by it in laboratory animals, not only with filtered cultures, but with certain products obtained from the filtrate of such cultures; the resemblance between the characters displayed by the sera of animals that have aborted and those shown by the sera of animals inoculated experimentally.

"The encouraging results obtained in the examination of the properties of the sera indicate that it may be found possible to recognize infection in mares intended for breeding and thus be of practical value. In the absence of more complete information epizootic abortion of the cow should be considered as something quite different from epizootic abortion among mares."

The persistence of *B. abortus* in the tissues of inoculated animals, M. FAYAN (*Jour. Med. Research*, 28 (1913), No. 1, pp. 81-83).—The author reports that this bacillus after injection into various laboratory animals has been recovered from their organs in culture many weeks later, even though there were in some no visible signs of the disease noted during life, at autopsy, or in sections.

"In those species in which the bacillus may cause lesions, the animal may harbor living organisms for over a year (67 weeks) without any external signs of ill health. That these animals are not without power slowly to destroy the bacillus is suggested by the relative diminution in the number of living organisms with the lengthening of the interval after inoculation. Whether this diminution as observed in the spleen is due to their transfer to other organs or to destruction can only be determined by large series of cultures."

A note on the presence of *B. abortus* in cow's milk, M. FAYAN (*Jour. Med. Research*, 28 (1913), No. 1, pp. 85-89).—The author collected samples of milk from 12 cows in a thoroughbred Guernsey herd that was kept for breeding, the milk being a by-product. Ten cows were chosen indiscriminately, and 2 which had aborted, one at the eighth month and the other at the third month. The milk from the former of the 2 which had aborted was taken one week and the latter 2 weeks following the abortion. In several instances the bacterial count was not over 1,100 per cubic centimeter, although the 2 cases of abortion gave much higher counts.

The presence of *Bacillus abortus* was not demonstrated in any of the samples by cultural methods. It was demonstrated by inoculation experiments with guinea pigs, however, that *B. abortus* was present in milk which came from the cow aborting at the eighth month and also in the milk of a cow which had calved normally 11 months previous and had been giving milk continuously up to the time the sample was taken. No abortion bacillus was obtained from the milk of the cow which had aborted at the third month.

The excretion of the abortion bacillus in the milk of infected animals, ZWICK and KRAGE (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 3, pp. 41-43; *abs. in Jour. Compar. Path. and Ther.*, 26 (1913), No. 1, pp. 59, 60).—In their first experiment the authors were able to demonstrate culturally the presence

of the abortion bacillus in the milk of a cow that had aborted 14 days previously. In the second case in which the bacillus was proved to be present in milk the animal had aborted 6 months previously. In the third case abortion had occurred 13 months previously. To the naked eye there was no alteration in the appearance of the milk, and no abnormalities were discoverable by clinical examination, either in the udder or in the associated glands. The authors therefore conclude that either the bacillus is able to pass through the udder without producing lesions at all, or that the lesions are so slight as to be unrecognizable clinically.

In order to determine whether the bacillus is responsible for lesions in the udder or changes in the milk and for how long injected bacilli may be excreted with the milk, experiments were made in which bacilli were injected into the udders. An agar culture of the bacillus made into an emulsion with 2 cc. of salt solution was injected into the right halves of the udders of 2 goats, the udders and milk of which were perfectly normal. Examinations of the milk showed that abortion bacilli were excreted therein for a period of from 3 to 5 months after the injection and that for about 8 weeks the number excreted hardly varied. Bacilli were never obtained from milk withdrawn from the left halves of the udders. During the whole of the period covered by the experiment there was no visible alteration either in the udders or in the milk.

A second series of experiments was undertaken in which 2 goats were inoculated subcutaneously with 10 cc. of an emulsion of the bacillus in salt solution, and a third intravenously with the same quantity of an emulsion of about half the density. The tables given by the authors show that abortion bacilli were being excreted in the milk of 2 of the goats (one infected subcutaneously and one intravenously) 24 hours after infection. The number of organisms present varied a little but was on the whole fairly constant, and the excretion of bacilli had not ceased 8 weeks after the commencement of the experiments. In the case of the other goat inoculated subcutaneously the bacillus was not found in the milk 24 hours after inoculation, and it was only found on the 4 following days, after which examinations constantly gave negative results. No abnormalities were discoverable either in the milk or in the glands, and the leucocyte content did not vary beyond the limits obtained before the commencement of the experiments.

Experiments on the destruction of the virus of foot-and-mouth disease in manure. F. LOEFFLER (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 7, pp. 113-115; *abs. in Jour. Compar. Path. and Ther.*, 26 (1913), No. 1, pp. 53, 54).—The author has found that in manure heaps the temperature rapidly rises to 60 and even 70° C. a few centimeters below the surface. Thus it appears to be certain that the virus of foot-and-mouth disease, which is destroyed on exposure to a temperature of 50° for 12 hours, could not retain its vitality in manure heaps for even a few days, and that it will only be necessary to cover a heap of infective manure with normal manure or straw for a few days in order to destroy the whole of the virus contained in it.

In conducting experiments along this line a mixture of fresh and 24-hour-old dung from cattle and pigs was laid on a layer of straw and packed somewhat tightly. The lymph used in the experiments was obtained fresh and diluted 1:20 with salt solution, after which it was passed through filters. The filtrate was placed in test tubes in quantities of 15 cc., the tubes being sealed and inclosed in tin cases. In addition control tubes were kept and the feet were cut from an infected pig which had lesions on all its feet, and wrapped in gauze. For the purpose of registering the temperature maximum thermometers were used which were also inclosed in metal cases. The thermometers, tubes of lymph, and feet were placed in the manure at the following heights

above the ground: 0.3, 0.5, 0.75, 1, 1.3, and 1.6 meters. A thermometer was also placed between the manure and the straw. After the whole of the dung had been packed a layer of straw 0.1 meter thick was placed on the top and this was covered with a similar layer of earth. The heap was left for 8 days during which time the temperature varied from 6 to 14° and no rain fell. The manure was then found to be well-rotted on the surface and felt quite warm. Upon removal of the thermometers it was found that the temperature in various parts of the heap varied from 55.5 to 75°, the highest temperatures being registered by the thermometers in the lower layers.

Young pigs which were inoculated with 1 cc. of a salt solution in which the feet were crushed failed to become infected with foot-and-mouth disease. Full-grown pigs were inoculated with from 12 to 15 cc. of the diluted lymph contained in the tubes and not a single case became ill. The experiments indicate that the whole of the virus was destroyed.

The influence of the subcutaneous mallein test upon the examination of the blood for diagnostic purposes, A. MARCIS (*Állatorvosi Lapok*, 35 (1912), Nos. 42, pp. 495-498, fig. 1; 43, pp. 508-511, fig. 1; abs. in *Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 8, pp. 136, 137).—In the blood of horses treated with mallein (subcutaneously), specific precipitins, agglutinins, and complement fixing amboceptors are produced. These are also noted in horses infected with the *Bacillus mallei*, and consequently blood examinations made after subcutaneous malleinization are without value.

After giving mallein subcutaneously, precipitins are first noted (in about 3 days), then the agglutinins (in from 5 to 7 days), and finally the complement fixing substances (6 to 10 days). They begin to vanish in about 3 months, and in practically the same order as they appeared.

Diagnostic blood examinations can only be of value 3 months after subcutaneous malleinization.

The laboratory diagnosis of glanders, E. M. WADE (*Jour. Infect. Diseases*, 12 (1913), No. 1, pp. 7-14).—"The diagnosis of glanders by the complement fixation test supplemented by the agglutination test on all negative sera is deemed the quickest and most reliable test at the present time.

"Glanders antigen prepared without shaking but filtered through a Berkefeld candle gives reliable results and yields a more stable product.

"Normal horse serum varies widely in its agglutinating power, therefore a weak positive should be considered in conjunction with the complement fixation test or with clinical symptoms.

"Antigens and agglutination fluids should be prepared from several strains of *Bacillus mallei*.

"While a positive result from guinea pig inoculation is conclusive evidence of the presence of glanders, failure of the pigs to develop lesions is not proof of its absence."

A note in regard to the pathologic anatomy of chronic diarrhea in bovines (enteritis chronica bovis paratuberculosis, Johne's disease), G. MOUSSU and FAROY (*Compt. Rend. Soc. Biol. [Paris]*, 70 (1911), Nos. 21, pp. 938-940; 22, pp. 982-984; abs. in *Bul. Inst. Pasteur*, 9 (1911), No. 17, p. 761).—This disease is not considered to be what is usually understood as pseudo-tuberculosis, nor is it human, bovine, or avian tuberculosis. Giving cultures to chickens per os does not confer a tuberculosis of the avian type, nor does the diseased animal give any of the various tuberculin reactions. The patho-anatomical findings are given in detail.

In regard to the present status of vaccination against coast fever, K. WÖLFEL (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 12 (1912), No. 3, pp. 247-255).—This is a critical discussion and description of Theiler's vaccination

method against coast fever. After vaccinating 343 diseased animals, 180 recovered and became immune. Some 2,000 vaccinations have been made by other veterinarians.

The pathogenicity of Johne's bacillus compared with that of other acid-fast bacilli for some of the laboratory animals, C. C. TWORT and T. CRAIG (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 68 (1913), No. 5-6, pp. 455-470).—Up to the present time cattle, sheep, and deer are the only animals which have been found to suffer naturally from this disease. In the authors' studies of the toxicity of Johne's bacillus, a comparison being made with many of the saprophytic acid-fast bacilli, they find the bacillus to be one of the least toxic among the acid-fast group of micro-organisms.

In regard to our knowledge of Malta fever, G. IZAR (*Biochim. e Terapia Sper.*, 3 (1911), pp. 208-218; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 5 (1912), No. 15, pp. 1142, 1143).—The serum obtained from subjects affected with Malta fever contains specific meiostagmins against antigens prepared from the Malta fever organisms. By introducing living cultures of the Malta fever bacterium intraperitoneally, meiostagmins can be produced in the blood of rabbits, but when killed cultures or alcoholic or watery antigens are injected, no meiostagmin production takes place. If fresh guinea pig serum is brought in contact with the precipitate produced when the micro-organism is treated with an immune serum, a toxic substance is produced, which, when injected into guinea pigs intravenously, causes death within a few minutes. The autopsical findings resembled those present in anaphylaxis. If the precipitate is emulsified with a salt solution, the toxicity is less.

Experiments on the efficiency of antirinderpest serum, A. R. WARD and F. W. WOOD (*Philippine Bur. Agr. Bul.* 19, 1912, pp. 109, figs. 187).—This material has been previously noted from another source (E. S. R., 27, p. 380).

The use of antiformin for detecting the open forms of tuberculosis, F. M. SCHMITT and O. PRÖSCHOLDT (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 11 (1912), Nos. 5, pp. 321-364; 6, pp. 401-449).—Antiformin can be employed for examining sputum, uterine fluids, mammary gland secretions, and feces for the presence of the tubercle bacillus, and for destroying other bacteria and spores which may be present. It, however, in the lowest allowable dilution affects the vitality of the tubercle bacillus. According to this, antiformin can be used for homogenizing the sample for the bacterioscopic examination, but care must be exercised when employing it as a preparative measure in the animal tests.

Tissues rich in tuberculous granulation may serve as antigens in the complement fixation reaction, E. GAUCHER, H. SALIN, and G. BRICOUT (*Compt. Rend. Soc. Biol. [Paris]*, 73 (1912), No. 31, pp. 439, 440).—The tissue employed was from the lung of a young infant and made into an alcoholic extract. The antigen was used in Wassermann's and Bauer-Foix's technique.

The blood picture in fowl tuberculosis, its relation to the so-called fowl leukemia, and some remarks on normal fowl blood, J. L. BURCKHARDT (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 14 (1912), No. 5, pp. 544-604).—These experiments were conducted for the purpose of gaining some further information in regard to the nature of leukemia in fowls. It is shown that a leucocytosis may occur in either a spontaneous or an experimental case of tuberculosis in fowls.

The leucocyte count was found to be chiefly between 100,000 and 200,000 per cubic centimeter, and rarely was it in the neighborhood of 376,000. These counts are higher than those previously reported by other authors. Proportionally the pseudo-eosinophils are highest, but absolutely and relatively the

lymphoid cells are also increased. The latter at times represent the majority of cells present. The lymphoid cells are to be regarded principally as precursors of the erythrocytes, and accordingly the blood picture present in fowl tuberculosis must be regarded as a mixture of leucocytosis and pernicious anemia. Like tuberculosis in fowls the so-called leukemia can be considered a variety of pernicious anemia. According to the author no marked difference exists in the blood picture presented in both of these diseases, but in no case was it possible to obtain a leukemia blood picture by injecting tubercle bacilli into animals.

The more recent work done in regard to fowl leukemia does not point to a filterable virus as the factor causing the disease.

The relative prevalence of human and bovine types of tubercle bacilli in bone and joint tuberculosis occurring in children, J. FRASER (*Jour. Expt. Med.*, 16 (1912), No. 4, pp. 432-442).—These observations were made with children chiefly 12 years of age or under, inhabiting Edinburgh and its neighborhood, and a large number of them inmates of the Royal Hospital for Sick Children. All material examined was obtained by operation, and of a total of 70 subjects, 39 were cases of joint disease, and the remainder bone disease.

No attempt was made to isolate the bacilli by direct cultivation, and all were obtained by guinea pig inoculation. All guinea pigs were allowed to live for 6 weeks and a careful record of each animal was kept. The most satisfactory cultures were obtained from the caseous interiors of diseased glands.

Most of the cases (29) up to the fourth year of age were due to bovine bacilli. At this age 9 were due to the human type, and 3 were of a doubtful type. Of the 70 cases, 26 were due to the human type of organism. In 21 cases there was a history of pulmonary tuberculosis in the families in which the children had lived, and in 50 per cent of these the child had actually lived in contact with a consumptive when the bone lesion developed. Seventy-one per cent of such cases were due to the human type of bacillus. "The bovine bacillus is introduced into the system practically by one route only, that of ingestion, and the medium with which it is ingested is cow's milk."

Investigations in regard to the early stages of tuberculosis in bovines, E. JOEST and P. KRACHT-PALEJEFF (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 12 (1912), No. 4, pp. 299-320, pls. 5).—The mammary glands examined were from 16 animals having generalized tuberculosis. Some of them came from animals which were in the lactating stage. The lymphatic glands of the supernumerary mammary glands of these animals were in most instances not enlarged, but in 50 per cent of the cases tubercle bacilli were detected in them with the guinea pig test.

The remainder of the material reported upon deals with the young tubercles in the intralobular interstitial tissue and its histogenesis, and the tubercles in the discharging galactiferous ducts of the mammary gland. It is concluded that both disseminated and focalized (submiliary) tuberculosis of the interalveolar tissues and the more diffuse tuberculosis of the galactiferous discharging ducts can be considered open forms of the disease even though the disease is not clinically apparent.

Combating tuberculosis among bovines in barns, O. VON ARNIM (*Illus. Landw. Ztg.*, 33 (1913), No. 4, pp. 21, 22, fig. 1).—The method recommended consists of making a permanent pasture into which the young animals are turned as soon as they are weaned. They are kept in the pasture from early spring until late fall, and forced to gather their own feed. Any of the old or young stock which is suspected of being tuberculous is sold. The animals which can be fattened, however, should be placed in separate pens for this purpose.

The methods of pasturing and the expenses involved are stated.

The repression of tuberculosis in dairy herds, J. D. STEWART (*Agr. Gaz. N. S. Wales*, 23 (1912), No. 3, pp. 223-233).—This is a critical review of the methods proposed and in vogue for repressing tuberculosis in dairy herds. It includes the methods for diagnosis and immunization, Bang's method, the question of employing tubercular help in dairies, and the feeding of pasteurized milk in rearing young animals.

The action of arsenical dips in protecting cattle from infestation with ticks, H. W. GRAYBILL (*U. S. Dept. Agr., Bur. Anim. Indus. Bul.* 167, pp. 27).—This bulletin reports the results of work with dips, undertaken mainly for the purpose of determining to what extent and how long an arsenical dip protects cattle from infestation with ticks after dipping.

In 3 experiments conducted with cattle, it was found that infestation was prevented for 2 days and that there was no protection when the exposure to infestation occurred 5 days or longer after dipping. Further experiments to ascertain if the protection extends beyond 2 days are in progress and will be reported later.

The author found that smearing the scutum and mouth parts of engorged females with oils and viscous substances had no influence on the mortality or oviposition, or on the percentage of eggs hatching.

Arsenical poisoning which occurred among the animals in one experiment was apparently caused by undissolved arsenic in the dip, indicating that undissolved arsenic in a dip is highly dangerous. "It is shown conclusively that the protective action of arsenic is dependent on its toxic action, and not on a repellent action. As a result of incidental observations made on engorged female ticks from animals suffering from Texas fever, it was found that the mortality of such ticks may be very high, as much as 95 per cent. The cause for this is not known. It may be nutritional in character, due to the changed or impoverished condition of the blood absorbed, or it may be due to the parasitism of *Piroplasma bigeminum*. . . . Observations made for the purpose of determining whether there was any relationship between the degree of infestation and the time elapsing between the last dipping and the infestation, and also on the mortality of engorged females from dipped animals infested subsequently to dipping, as compared with that of ticks from undipped animals, were inconclusive. Oviposition and viability of the eggs of these ticks appeared to be unaffected."

Epidemic interstitial pulmonary emphysema in milch cows, KNESE (*Berlin. Tierärztl. Wchnschr.*, 28 (1912), No. 48, pp. 804, 805; *abs. in Vet. Rec.*, 25 (1912), No. 1272, pp. 307, 308).—The author reports on the occurrence of an epidemically appearing disease of cows observed in Norden, the cause of which has not been determined. He regards the affection as a peracute, interstitial, pulmonary emphysema combined with catarrhal pneumonia.

Hookworm disease in sheep and other animals (*Agr. News [Barbados]*, 12 (1913), No. 288, p. 149).—*Æsophagostomum venulosum* is thought to be the cause of "la gomme" in Dominica, and *O. columbianum* to cause nodular disease in St. Lucia and St. Vincent.

Fixed hog cholera virus, J. REICHEL (*Jour. Infect. Diseases*, 12 (1913), No. 1, pp. 106-110; *Amer. Vet. Rev.*, 42 (1913), No. 5, pp. 559-563, fig. 1).—For preparing fixed hog cholera virus, or one which had attained the highest degree of virulence possible, 19 strains of seed virus obtained from outbreaks in 8 States were given in 2 to 5 cc. doses subcutaneously to 1,964 susceptible hogs. Of these 1,720, or 93.7 per cent, became diseased in less than 40 days.

"The virus hogs were kept in regulation virus pens 8 by 10 ft., elevated 18 in. from the ground on 4 legs, with waterproof metal-lined floor, slant roof, both sides solid, small narrow dropdoor for ventilation in back, with door and 2 windows in front. Each pen is equipped with a wooden feeding trough and card holder to accommodate a card for each hog. The pens are placed in 2 rows of 5 each, from 4 to 5 ft. apart. The 2 rows are separated by a fenced alley approximately 10 ft. wide. The group of pens in turn is surrounded by a fence which prevents all communication from pen to pen except by the doorway of each pen."

Not all of the strains were continually passed through the susceptible animals, and 6 strains at the utmost were used at any one time. "A strain passed through hogs during a number of separate but not consecutive months, was injected into not less than one lot of hogs each month and during that month the strain may have been passed through 2 or more hogs."

In some cases the injections were given for 13 months. With one exception all the strains showed a gradual increase in virulence, and were capable of producing, when arriving at the fixed stage, the first symptoms of hog cholera on the fifth or sixth day, with death resulting on the seventh or eighth day. From 2 to 5 cc. of the virus was given. The virus collected from these hogs was used for hyperimmunizing 1,181 hogs, of which only 6.7 per cent received one or more intraperitoneal injections, and 2.7 per cent one or more subcutaneous injections.

A typhoid-like disease in rabbits caused by *Bacillus suispesticus*, with particular reference to the clinical course and prophylactic vaccination, T. ORDWAY, E. KELLERT, and F. P. HUESTED (*Jour. Med. Research*, 28 (1913), No. 1, pp. 41-79, pl. 1, figs. 9).—A clinical and pathological study of this disease.

Bacillary white diarrhea of young chicks, L. F. RETTGER, W. F. KIRKPATRICK, and F. H. STONEBURN (*Connecticut Storrs Sta. Bul.* 74, pp. 153-185, pls. 2, figs. 9).—This third report on the subject (*E. S. R.*, 25, p. 590) presents some of the more important results which have been obtained during the past 2 years in investigations carried on at the Connecticut Storrs Station.

It has been found that the period of greatest danger from bacillary white diarrhea lies within the first 48 hours, but that chicks may acquire the disease up to the time they are 4 days old. "Hens may become bacillus carriers after they have reached maturity. The ovaries may become infected by contact of the hens with infected hens, or by artificial infection of the litter. The infection is, in all probability, acquired through the mouth.

"The feeding of sour milk to chicks appears to be a good means of preventing, or at least holding in check, epidemics of bacillary white diarrhea. Hence, whenever it is impossible or impracticable at once to introduce new stock, sour milk may be an important agent in lessening the dangers of great loss from the disease. The sour milk should be fed early; furthermore, it should be kept before the chicks constantly. Sour milk has an important stimulating effect on the growth and vitality of chicks, and for this reason alone it is a most valuable food.

"For the complete elimination of white diarrhea from a poultry farm it is necessary to reject for breeding purposes stock which harbors white diarrhea infection, and to obtain eggs or live stock from sources where white diarrhea infection has not been known to exist. It should be considered both a moral and legal offense for persons to sell or exchange eggs, chicks, or mature stock which come from flocks that they know to be infected with the germ of bacillary white diarrhea.

"Every precaution should be taken to protect mature stock against infection by the white diarrhea bacillus. It is, therefore, important that mature hens, as well as growing stock, be kept in good clean houses and large yards; that they receive wholesome food and the best of care. Finally, that they be not allowed to come in contact with infected chicks or mature stock."

RURAL ENGINEERING.

Civil engineers' pocketbook, A. I. FRYE (*New York and London, 1913, pp. XLII+1611*).—This is a reference book for engineers, contractors, and students and contains rules, methods, useful data, formulas, and a large number of tables.

Irrigation pocketbook or facts, figures, and formulas for irrigation engineers, compiled by R. B. BUCKLEY (*London, New York and Calcutta, 1911, pp. 419, figs. 71, pl. 1*).—This handbook is a compilation of accepted facts, data, and formulas bearing on the everyday work of the irrigation engineer, which have been drawn from British government reports, publications of leading engineers, and the proceedings of engineering societies in England, Ireland, and the United States.

Ninth biennial report of the state board of irrigation, highways and drainage (*Bienn. Rpt. Bd. Irrig. Nebr., 9 (1911-1912), pp. 262, pls. 35, figs. 8*).—This is a report of the irrigation, drainage and highway operations in Nebraska during 1911-12, containing a large amount of stream measurement data, notes on claims and applications for water, and a progress report on the construction and maintenance of highways. Several detailed plans of the larger highway structures are included.

Seepage losses in irrigation systems, E. G. HOPSON (*Sci. Amer. Sup., 75 (1913), No. 1934, pp. 56-59, figs. 22; Engin. News, 69 (1913), No. 13, pp. 618-623, figs. 7*).—Data on evaporation and seepage losses from 4 large reservoirs and on the total losses from reservoirs, main ditches, and laterals of 6 irrigation projects of the United States Reclamation Service in the northwestern United States are given.

Canal linings and the use of pipe to prevent the loss of irrigation water are described, and figures are given showing the ultimate economy of lined as compared with unlined canals. It is concluded that as an engineering and business policy the protection of canal systems from seepage losses is worthy of consideration in all construction and operation, and in the extension of those irrigation works already constructed.

Earth reservoir dams, A. A. MEYERS (*Aarden Reservoirdammen [Amsterdam, 1911], pp. VII+90, pls. 21, figs. 10; Arch. Suikerindus. Nederland. Indië. Bijlage*).—This book deals with the construction of earthen dams for irrigation, water power, and water supply. It contains chapters on the applicability of earthen dams, their principal types, materials used in their construction, methods of examining the qualities of available building material, use of different earths as material, the puddle core, core walls, sluiced reservoir dams, drainage, foundations, determining the thickness of the dam, wave action on earthen dams, construction, cost of preparing the ground, closing the dam, and slips and breaks.

Yakima Indian Reservation drainage project, J. W. MARTIN (*Engin. News, 69 (1913), No. 8, pp. 343-347, figs. 4*).—Overuse of irrigation water having turned productive farms on the Yakima Indian Reservation, Wash., into swamps and barren alkali flats, a drainage system comprising 218,839 ft. of canals and laterals was constructed to tap the underlying bed of gravel. This experiment, it is stated, has proved successful in reclaiming the waste land.

Facts concerning the earlier and later irrigation works, and regarding the design and construction of the drainage works are given, including cost figures for the latter, which totaled \$220,215.55, or about 12 cts. per cubic yard, for excavation.

The drainage experimental field in Josephsdorf, E. KRÜGER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg*, 5 (1913), No. 3, pp. 173-185, pl. 1, fig. 1).—Two years' drainage experiments were conducted in a 9-acre field of compact soil with a view to establishing definite relations between quantity of crop yield, depth of and distance between drains, soil ventilation, and the effect of drainage on ground water level. The drains were laid in distances apart of 8, 12, and 16 meters and at depths of 0.9, 1.2, and 1.5 meters. Ventilating pipes were provided on some drains and not on others. Small wells were sunk to observe the effect of the various arrangements of drains on the ground water level and on the physical condition of the soil.

The best yields of crops were obtained from the plats with ventilated drains laid to the minimum depth of 0.9 meter, and the next best results from the plats with unventilated drains laid to the maximum depth of 1.5 meters. Of those plats which were drained to the intermediate depth of 1.2 meters the best results were obtained where the drains were not ventilated, so that on the whole the unventilated drains gave the best results. Although better results were obtained from the shallowest and deepest drains than from the drains of intermediate depth no set rule or definite relations were established.

Several tables are given showing various effects on the ground water level and on the physical condition of the soil.

United States Government specification for Portland cement (*U. S. Dept. Com. and Labor, Bur. Standards Circ. 33*, pp. 28, figs. 10).—This list includes general specifications and standard methods of testing, methods of chemical analysis, and interpretations of chemical and physical specifications, with auxiliary specifications by the Bureau of Standards.

Specifications for drain tile and sewer pipe, A. MARSTON, S. DEAN, and W. B. WARRINGTON (*Engin. Rec.*, 67 (1913), No. 9, pp. 235, 236; *Cement Era*, 11 (1913), No. 3, pp. 56-58).—This is a committee report adopted by the Iowa State Drainage Association, based upon data collected during 6 years' investigation at the Iowa Engineering Experiment Station. These specifications are intended to obviate the danger of cracked pipe in ditches, and are so worded that the contractor has the alternative of furnishing stronger pipe or of bedding the pipe in concrete in the deeper parts of the trench.

Studies of coefficient of friction in reenforced-concrete pipe, Umatilla project, Oregon, H. D. NEWELL (*Engin. News*, 69 (1913), No. 18, pp. 904, 905, fig. 1).—The results of service tests are reported on 30 and 46 in. reenforced-concrete irrigation pipe and on 16 in. cement pipe to determine the value of the friction factor "n" in Kutter's formula and of "c" in the formula $v=c\sqrt{rs}$ under varying slopes and velocities of flow. The summary of results is as follows:

The 46-in. pipe, 9,831 ft. long under a maximum head of 110 ft. with slopes of 0.00087, 0.00078, 0.00108, 0.00102, and respective velocities of 4, 3.98, 4.17, 4.21 ft. per second, gave respective values for "c" of 138, 145, 130, 135, and for "n" of 0.0111, 0.0106, 0.0117, and 0.0113. A 30-in. pipe, 5,330 ft. long under a maximum head of 45 ft. and with slopes of 0.00107, 0.00105 and 0.00105, and respective velocities of 3.61, 3.39 and 3.47 ft. per second, gave respective values for "c" of 140, 132, and 135, and for "n" of 0.0103, 0.0108, and 0.0106. A 30-in. pipe, 3,645 ft. long under a maximum head of 25 ft. and with a slope of 0.00086 and a velocity of 2.73 ft. per second, gave a value for "c" of 118 and for "n" of 0.0119. A 16-in. cement pipe, 700 ft. long under a maximum head

of 9 ft with slopes of 0.0038 and 0.0045, and respective velocities of 2.68 and 3.49 ft. per second, gave respective values for "c" of 75 and 90, and for "n" of 0.0154 and 0.0134. A 16-in. cement pipe, 909 ft. long under a maximum head of 18 ft. with a slope of 0.0019 and a velocity of 2.45 ft. per second, gave a value for "c" of 98 and for "n" of 0.0125.

Concreting in cold weather (*Chicago, Pittsburg, and Minneapolis, 1912, 3. ed., pp. 12, figs. 11*).—This pamphlet deals with the preparation, mixing, and placing of concrete in cold weather in the construction of such farm structures as foundations, barn, shed, and feeding floors; and building blocks, sills, slabs, and fence posts.

The information is summarized under the following rules and suggestions: (1) Examine all the materials before using in the work and be sure that they are not frosty or frozen. (2) Heat the material as uniformly as possible. (3) Place each batch of concrete in the work immediately after mixing. The temperature of the concrete when placed should not be below 50° F. (4) Before pouring the concrete free the inside surfaces of the forms from ice and snow, and in very cold weather warm them in some manner. Never place concrete in steel forms until they are warmed if the temperature is below 30° F. (5) In case of delay cover the surface until concreting is resumed. (6) Cover and protect any section of the work from freezing temperature as soon as completed, and in cold weather keep the work protected for at least 5 days.

Papers, addresses, and resolutions before the American Road Congress (*Richmond, Va.: Amer. Road Cong., 1911, pp. 191*).—The papers dealing with road administration, construction, maintenance, and repair are as follows: Good Roads and the Farmer, by W. W. Finley (pp. 11–15); Good Roads and Waterways, by J. H. Moore (pp. 16–23); The Road through Delaware, by T. C. du Pont (pp. 24–30); Stone and Gravel Roads, by W. A. McLean (pp. 32–44); Earth and Sand-Clay Roads, by P. St. J. Wilson (pp. 44–50); Bituminous Roads, by W. W. Crosby (pp. 50–58); Road Costs and Maintenance, by A. H. Blanchard (pp. 58–69); The Relation between Engineers and Contractors on Highway Work, by O. Bates (pp. 70–78); The Contractor in Road Work, by D. L. Hough (pp. 78–106); Highway Bridges, by A. N. Johnson (pp. 106–113); Motor Traffic Regulation in Massachusetts, by W. D. Sohler (pp. 117–128); Traffic Rules and Regulations, by R. Sylvester (pp. 128–142); Relation of the Automobile Industry to the Good Roads Movement, by H. Chalmers (pp. 142–149); A Model State Motor Vehicle Law, by E. Lazansky (pp. 149–161); The Motor Vehicle Law of Connecticut, by M. S. Rogers (pp. 162–171); Relation of Motor Vehicle Laws to Good Roads, by S. S. Gorham (pp. 171–176); Louisiana Highways, by G. Lombard (pp. 177–181); and The Virginia Convict Labor Law, by C. T. Lassiter (pp. 181–187).

Proceedings of the third annual convention of the Inter-Mountain Good Roads Association (*Proc. Inter-Mountain Good Roads Assoc., 3 (1912), pp. 35, figs. 17*).—These proceedings include progress reports on road construction and maintenance in the various States included in the association.

Proceedings of the tenth annual meeting of the Ontario Good Roads Association, 1912 (*Proc. Ontario Good Roads Assoc., 10 (1912), pp. 63*).—These proceedings include the following papers on road construction and maintenance: County Road Construction in Ontario, by W. A. McLean (pp. 13–15); Federal Aid for Good Roads, by H. J. Bowman (pp. 15–17); Progress of State Aid in the United States, by P. D. Sargent (pp. 24–32); Foreign Road Systems, by L. A. Hamilton (pp. 34–37); Wellington County Roads, by J. M. Young (pp. 38, 39); Stone and Gravel Roads, by C. Talbot (pp. 39, 40); Stone and Gravel Roads, by E. A. James (pp. 40, 41); Hastings County Roads, by N. Vermilyea

(pp. 41-43); Permanent Bridges, by J. A. Bell (pp. 44-48); and Peel County Roads, by C. R. Wheelock (pp. 49-51).

Jacket water requirements of internal combustion engines, R. TRAUTSCHOLD (*Power*, 37 (1913), No. 14, pp. 494-496, figs. 3).—Results of tests of the effect of load on fuel and jacket water consumption show that at $\frac{3}{8}$ load, about the lightest load that an engine in an efficient installation is called upon to carry, the fuel requirements per horsepower were 54.5 per cent greater than when operating under full load, while the jacket water requirements were 2.85 times as great as under the more efficient operation. Considering 35° F. as the minimum and 80° as the maximum practical entrance temperature for the jacket water supply, tests of the effect of supply temperature on jacket water consumption show that at 35°, the water consumption with $\frac{3}{8}$ load was 2.735 times the consumption at full load, and at 80°, 2.2 times the consumption at full load. These tests also showed that the water consumption at full load and at 80° entrance temperature was 1.422 times the consumption at full load and at 35° entrance temperature.

Reciprocating pump curves, A. M. DANIELS (*Power*, 37 (1913), No. 14, pp. 488, 489, fig. 1).—This article describes the construction and use of curves for determining the size of reciprocating pumps required under given conditions.

Slippage of reciprocating pumps, M. K. BAER (*Power*, 37 (1913), No. 14, pp. 482, 483, figs. 2).—Test results of reciprocating pumps show the fallacy of the assumption that the average slip of reciprocating pumps is about 5 per cent, and indicate that the slip will vary from 5 to 85 per cent, depending on the condition of the pump, the discharge pressure, and the piston speed.

New features in the construction and operation of plowing implements and motor plows, P. GISEVIUS (*Landw. Hefte*, 1913, No. 14, pp. 35, figs. 39).—This pamphlet describes new features in the construction of plow frames, hitches, and the working parts of plows, and deals with steam, electric, and internal combustion power in their latest application to the various methods of motor plowing.

Report of tests of potato sprayers, S. LAKO ET AL. (*Meded. Rijks Hoogere Land, Tuin en Boschbouwsch.* [Wageningen], 5 (1913), No. 5, pp. 253-261).—The results of competitive tests of 6 horse-drawn potato sprayers are reported. The machines were to cover a width of 10 ft. without damaging the crop.

An English machine gave the best results, due to its greater simplicity and ease of operation. This machine consists of a car and truck, with wheels 44 in. in diameter which can be set 43 to 71 in. apart. A wooden barrel is set between the wheels from which the liquid is drawn by a direct-acting suction and force pump and forced under pressure into the spray pipe. The pump is equipped with an air chamber and spring valves to regulate the pressure and flow of the liquid. This machine applied from 50 to 200 gal. of lime-sulphur per acre, spraying 5 rows at a time.

The army horseshoer (*War Dept.* [U. S.], *Doc.* 423, 1912, pp. 106, pl. 1, figs. 66).—This is a manual prepared for the use of students of the Training School for Farriers and Horseshoers. It contains chapters on the following: (1) Horseshoers' tools and their uses, the forge; (2) the fire, heats; (3) working and shaping iron, the plate shoe; (4) anatomy and physiology of the horse's foot; (5) normal shoeing; (6) gaits, shoeing to conform or alter same, faults in gaits, shoeing to correct same, and the making of shoes for special gaits; (7) diseases, the making of pathological shoes; and (8) shoeing refractory horses.

[Plans and estimates for the construction of a swine-fattening establishment], F. E. VON BRAUN (*Landw. Jahrb. Bayern*, 2 (1912), No. 3, pp. 153-164, figs. 12).—Situation and detailed working plans are given of hog feeding and

fattening buildings and of buildings for feed storage, with bills of material and a cost estimate for the entire establishment which totals \$1,654.87.

How to build a "hendwel" to house 1,000 hens, R. C. LAWRY (*Rel. Poultry Jour.*, 20 (1913), No. 2, pp. 224, 225, 302, 303, figs. 9).—This article gives plans, specifications, and a bill of material of a poultry building 30 ft. wide and 6 ft. long containing 2 floors, each divided into 2 rooms. The upper floor is used for roosting. It is claimed that 1 man can care for 3 such houses, containing 3,000 birds.

The improved New York State gasoline-heated colony-house brooding system, C. A. ROGERS (*New York Cornell Sta. Circ.* 16, pp. 52, figs. 54).—In this circular are described and illustrated the working plans of the New York State A-shaped colony brooder house and its equipment for heating by gasoline, substantially as previously noted (E. S. R., 23, p. 591).

A new type of sewage sedimentation tank, Mount Washington, Md., H. T. OLIVER (*Engin. News*, 69 (1913), No. 15, pp. 722-724, figs. 2).—A description is given of a new type of sedimentation tank so arranged with baffles and compartments that surface waters are allowed to move with a velocity of 1 in. per second, and the more heavily laden waters at the bottom are retained a longer time, thus allowing a thorough sedimentation to take place. An 80 per cent sedimentation is claimed for this arrangement. No septic action takes place, the effluent being discharged into a neighboring stream in stable condition. The deposited sludge is siphoned off to be deodorized in a separate chamber, while provision is made to disinfect the tank effluent if necessary.

Mosquito extermination and its problems, E. WINSHIP (*Engin. Rec.*, 67 (1913), No. 18, pp. 490-492, figs. 2).—This article calls attention to the work of mosquito extermination as practiced in rural and suburban districts of New Jersey, Staten Island, and other Atlantic coast districts. Surface oiling and various methods of drainage were experimented with, and it was found that small open drains 2 ft. deep, of 1 spade width, and spaced 150 ft. apart gave the best results and economic success. It is stated that for success in this work the engineer in charge must have, in addition to his technical and drainage engineering training, special fitness for and special training in this particular branch of rural engineering.

RURAL ECONOMICS.

The farmer of to-morrow, F. I. ANDERSON (*New York*, 1913, pp. VII+308).—This volume brings together and discusses in a popular way some of the fundamental factors affecting the business of farming. Special attention is given to land area and resources of the land itself in terms of soil fertility and the interrelation of the 2 factors in determining types of farming and their economic influences upon the community.

Farm accounts, C. S. ORWIN (*Jour. Farmers' Club [London]*, 1913, Apr., pp. 45-65).—This pamphlet discusses at length the economic importance of keeping farm accounts, showing among other things that they have the effect of making farmers more frugal in their business, and oftentimes causing them to change from a nonpaying type of farming to one of profit. Simplified systems of keeping account of each farm transaction are analyzed and explained in detail. Illustrations are given showing the method of accounting and how each item should be accounted for under manual labor, horse labor, rent, insurance, crops consumed, feeds and manure purchased, profits and loss, etc.

Commerce and products of agriculture, E. POHER (*Le Commerce des Produits Agricoles*. Paris, 1912, pp. 498, figs. 125).—This volume treats of selling associations and their influence upon agricultural production and consumption,

showing the various kinds of societies, and their organization, method of handling, selling, etc., in different countries. Chapters are devoted to cooperative selling organizations in France and other countries, showing their advantages and drawbacks; how they are aided by legislation; the different types of societies, how they are operated and the progress made; and the effect they have had in securing better transportation facilities, elimination of frauds and falsifications in commerce, the growing of special crops, and general agricultural prosperity.

The problem of agricultural distribution, K. L. BUTTERFIELD (*Farmer*, 31 (1913), No. 31, p. 827).—Some of the chief factors in the problem of marketing farm products, with suggestions as to the main lines of relief, are pointed out and discussed.

Marketing farm products, W. J. SPILLMAN (*Cream and Milk Plant Mo.*, 1 (1913), No. 9, pp. 16-18).—The author discusses in this article some of the economic principles involved in the cooperative marketing of farm products on the part of the producer and consumer, showing how the law of supply and demand would operate to prevent overproduction and at the same time secure the greatest maximum return.

Farmers' selling agencies, L. S. TENNEY (*Cream and Milk Plant Mo.*, 1 (1913), No. 9, pp. 13-16).—This is an address in which the author discusses agricultural cooperation as an effective method of marketing farm products, pointing out particularly the necessary conditions of success and the usual causes of failure in unsuccessful undertakings.

Organizations for furthering agriculture, L. KIESSLING (*Landw. Jahrb. Bayern*, 2 (1912), No. 4, pp. 204-228).—The activities of the various agricultural organizations in Bavaria are here described, showing how they are affiliated with each other and the progress made in their respective lines of work.

Rural credits—cooperative finance, E. O'NEAL (*Montgomery, Ala.*, 1912, pp. 21).—This is an address delivered at the Governors' Conference, Richmond, Va., December 6, 1912, in which the author discusses the need of agricultural credit in the United States and the uses to which it may be applied, with a limited description and discussion of European credit organizations and the application of the principles involved to conditions in the United States.

Farmers' cooperative banks, D. A. TOMKINS (*Manfrs. Rec.*, 63 (1913), No. 19, p. 53).—The author makes suggestions relative to the adaptation of the building and loan association plan to the financial needs of farmers, showing how groups of farmers in any community may, without artificial aid, organize an association upon the basis of the building and loan association, and through that make available whatever money may be needed by its members for farming operations or farm improvements.

A farmers' cooperative company that inspired a state law (*Farmers' Guide*, 25 (1913), No. 23, pp. 661, 662, fig. 1).—The organization, progress, and work of a farmers' cooperative organization at Colfax, Ind., for buying and selling farm products, fertilizers, fuel, building materials, seeds, etc., are here described.

The company began operation in 1910 with a capital stock of \$20,000. Over 235,000 bu. of grain were handled the first year with a net profit that amounted to over 30 per cent interest on the money invested, the farmers receiving at the same time 2 cts. per bushel more than that paid in surrounding markets. Its membership consists of 135.

The text of the law recently enacted by the state legislature providing for the organization of cooperative associations is also given.

The country church and community cooperation, edited by H. ISRAEL (*New York and London*, 1913, pp. 170).—The matter presented in this volume in-

cludes papers and recommendations by a commission appointed to study rural problems and suggest ways and means for vitalizing social, educational, and economic rural life in the United States. The chapter headings are arranged as follows: Community cooperation—the country school and the country church; religious education as a factor in training for country life; a coordinating factor; educational readjustment of country life; how a whole community is being helped; the value of a social survey to a community; a method of making a survey; the new rural South; religious and educational cooperation with county and state fairs; play a socializing factor in rural communities; the moral and educational value of athletics; the importance of the social survey; the need of trained leadership in rural life; home-made leaders; religious education in country life; and the opportunity of the country pastor to direct social enterprises.

Notes on agricultural conditions in Denmark, M. F. EGAN (*U. S. Senate, 62. Cong., 3. Sess., Doc. 992, 1913, pp. 34*).—This document presents notes and data on a number of the economic phases of agriculture in Denmark, special attention being given to land tenure, agricultural education, cooperation, and government assistance to small farmers, and agricultural laborers.

It is noted that by acts of 1900 and 1909 the government has agreed to loan a certain sum of money to any man or woman of good character and who had been an agricultural laborer for 5 years or had worked on farms of a particular character and size as stipulated in the law. The money borrowed is to be used in the purchase of land and the loan will be granted to the extent of nine-tenths of the value of the farm selected up to 8,000 kroner (\$2,144). The rate of interest is 3 per cent per annum and the loan is exempt from installments the first 5 years, after which two-fifths of the loan pays 4 per cent annually (3 per cent interest and 1 per cent installment). When two-fifths of the loan has been paid the residue then pays 4 per cent annually.

The amount of the state loans granted to small holders according to the laws of 1899, 1904, and 1909 during the years 1900 to 1911 is reported at 25,410,418 kroner, divided among 5,777 holdings.

Cost of living [in Bavaria], T. W. PETERS (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 123, p. 1032*).—This part of the report describes the efforts made by the Bavarian Government and its constituent States and communities to aid in reducing the cost of living through special measures. The Imperial Government is shown to have reduced the tariff duty on certain necessities and the Bavarian railways the freight rate by 20 per cent on meat imported by communities of cooperative societies on their own account and sold at or under first cost, or by butchers to others at prices fixed by the authorities.

It is noted that the government's intervention resulted in a reduction in the usual price paid farmers for milk.

Report of commission on the cost of living in New Zealand (*Wellington: Govt., 1912, pp. CXXXVI+510*).—This is the report of a commission appointed by the dominion government in 1912 to inquire as to whether the cost of living has increased in New Zealand during the past 20 years, and if so, the relative increase as compared with other English-speaking countries, the items of increase, their causes, remedies, etc. The minutes of the proceedings, evidence, and findings of the commission are reported in detail.

[Agricultural] production (*So. Aust. Statis. Reg., 1911, pt. 3, pp. 1-188*).—Notes and statistics showing a census of land, crops, agricultural labor, agricultural education, and various other agricultural activities in South Australia for 1911 are here presented.

The number of persons engaged in rural occupations in 1907 is reported at 37,360 males and 12,874 females, and in 1911, 41,916 males and 16,977 females. Of the total number of females 9,889 were engaged principally in dairying, while only 1,608 males were so employed in 1911.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter*, 15 (1913), No. 5, pp. 33-40).—Crop conditions for May 1 with comparisons for last year and for a 10-year average are here reported. Notes and tables are also given showing the acreage and yield of cotton in 1912 by States; estimated farm value of important products on April 1 and May 1 compared with the average for the last 5 years; a yearly summary of the "world" production of important crops; the relative importance in value of leading crops; a preliminary report on Louisiana cane sugar, 1912; average prices of meat animals for each month, 1910-1913; a reprint of Circular 43 of the Office of the Secretary, previously noted (*E. S. R.*, 29, p. 144); cotton consumption statistics; a basis for interpreting crop condition reports; commercial apple movement, 1912; temperature and precipitation statistics; monthly receipts and stocks of butter and eggs; and range of prices of agricultural products at important markets.

Foreign crops, March-April, 1913, C. M. DAUGHERTY (*U. S. Dept. Agr., Bur. Statis. Circ. 47*, pp. 27).—This circular presents the usual notes and data showing area, production, imports, exports, prices, etc., of specified crops in foreign countries for varying periods of years.

AGRICULTURAL EDUCATION.

The work of the Massachusetts Agricultural College for the schools of Massachusetts, W. R. HART (*Facts for Farmers* [*Mass. Agr. Col.*], 3 (1913), No. 6, pp. 4).—This is a brief statement of the work of the agricultural education department of the Massachusetts Agricultural College in (1) training teachers of agriculture in the regular college courses and in the summer school, and (2) the promotion of agricultural clubs to advance the teaching of agriculture in the schools.

The second annual report of the School Garden Association of America, meeting with the National Education Association (*Ann. Rpt. School Garden Assoc. America*, 2 (1913), pp. 57, figs. 27).—This second annual report contains among other things a brief school garden bibliography, an account of the training of Ontario teachers for school garden work, extracts from representative reports of school garden work in the United States, and outlines of practical school garden work covering such matters as bulbs in the classroom, a planting lesson for the individual plat holders, observation plats, greenhouses for city children, and children's home gardens.

Report of the Rural Education Conference on the qualification of teachers of rural subjects (*London: Bd. Agr. and Fisheries and Bd. Ed.*, 1911, pp. 28).—This is the second report of the Rural Education Conference and deals with the lack of teachers properly qualified for giving instruction in rural subjects in elementary schools, and the means which should be taken to raise the standard of efficiency in these subjects.

The conference recommends that (1) the length of the ordinary training college course be extended one year, not necessarily consecutive with the first two years, during which teachers would be able to specialize and those desiring to take up rural subjects might be allowed to do so at colleges or farm institutes; (2) all county local education authorities should be required to provide for their existing teachers, or such future teachers as have not attended a training college, evening, Saturday, or vacation classes and in connection with these, two or three months' courses at an agricultural or horticultural college

or farm institute where the teachers would receive free instruction and their ordinary pay; (3) local education authorities should encourage rural teachers by making their pay more nearly equal to that of town teachers; (4) the curriculum of the rural secondary schools should be modified to include special courses in rural subjects for bursars and other intending rural teachers, and (5) additional aid should be given to county local education authorities to enable them to carry out the suggestions made. Summaries of evidence are appended.

Seventh report of the Rural Education Conference on manual instruction in rural elementary schools and the individual examination of children in rural elementary schools (*London: Bd. Agr. and Fisheries and Bd. Ed., 1913, pp. 23*).—This seventh report of the Rural Education Conference is devoted to a consideration of (1) the possibility and advisability of introducing manual instruction, i. e., instruction in cookery, laundering, housewifery, dairying, and gardening for girls, and gardening, handicraft, and light woodwork for boys, and (2) the initiation of a system of periodical individual examination of children in rural elementary schools. The conference recommends that the county education authorities encourage the gradual introduction of the manual method of teaching into these schools. Summaries of evidence are appended.

Agricultural education in Prussia (*Jour. Bd. Agr. [London], 20 (1913), No. 1, pp. 1-14*).—This is a short account of elementary agricultural education in Prussia and of the facilities provided at the present time for educating farmers' sons.

Attention is called to the tendency shown by winter schools to increase and by the lower agricultural schools to decrease. "The important inference would appear to be that schools with farms attached have been shown to be for the most part not necessary as long as the class from which the students are taken is an agricultural one; in cases where they are not so drawn the argument applies, or does not apply, according to whether a period of apprenticeship is, or is not, required, before attending such a school."

Special reference is also made to "the decentralization of lower agricultural education and the payment of a small fixed sum as state aid with indirect assistance given in the form of grants for peripatetic work. This system appears to have worked well as soon as the local authorities and local agricultural societies had realized their responsibilities in the matter." The agricultural education facilities offered in Prussia are regarded as "suitable to the various classes requiring them, and are so arranged as to correspond to the needs of these particular classes, but do not supply anything in the shape of an educational ladder."

[Agriculture for teachers] (*Bul. Okla. Agr. and Mech. Col., 8 (1912), No. 36, pp. 4, figs. 3; 9 (1912), Nos. 38, pp. 2; 39, pp. 2; 41, pp. 2; 42, pp. 2; 43, pp. 2; 9 (1913), Nos. 44, pp. 2; 46, pp. 2; 49, pp. 2*).—These issues of the teachers' series of bulletins comprise the following topics: Nature study—the experience of an Oklahoma school teacher, how to secure literature on agriculture and domestic science—rural school reading table and library suggestions, school district agricultural resources, nature's cycle, hibernation of insects, the rôle of organic matter and micro-organisms in the soil, suggestions from nature in rearing and feeding dairy stock, relative economy of food producing farm animals, and the planting of trees.

[Agricultural instruction for the teachers of Porto Rico] (*Agr. Col. Weekly [P. R.], 1 (1912), Nos. 3, pp. 13-16; 4, pp. 17-23, fig. 1; 5, pp. 25-28; 6, pp. 29-32; 7, pp. 33-36; figs. 3; 8, pp. 37-40; 9, pp. 41-48, fig. 1; 10, pp. 49-52; 11, pp. 53-56, figs. 2; 12, pp. 57-60, fig. 1; 13, pp. 61-64, figs. 3; 14, pp. 65-68, figs. 2; 15, pp. 69-80; 1 (1913), Nos. 16, pp. 81-88, figs. 7; 17, pp. 89-92; 18,*

pp. 93-96, figs. 2; 19, pp. 97-100, figs. 4; 20, pp. 101-104; 21, pp. 105-108; 22, pp. 109-116, figs. 3; 23, pp. 117-131; 24, pp. 133-136; 25, pp. 137-140, figs. 7; 26, pp. 141-144; 27, pp. 145-152, figs. 2; 29, pp. 157-160, fig. 1; 31, pp. 165-168, fig. 1; 32, pp. 169-172, fig. 1; 33, pp. 173-176, fig. 1).—The subjects discussed in these articles, issued by the Porto Rico College of Agriculture and Mechanic Arts to assist teachers, are as follows: An outline of a proposed course in agriculture for the teachers of Porto Rico, the flower, birds, soils, seeds, directions for making an agricultural booklet, poultry, the preparation of soil, roots, insects, stems and leaves, propagation of plants, courses offered by the Porto Rico College, suggestions for making a school collection of insects, cultivation of soil, fungi, bees, soil fertility, the dairy cow, information concerning the college and its instruction, Easter week program at the college, propagation by budding and grafting, the water relations of soil, live stock judging, a group of carbohydrate foods, the horse, the first agricultural conference for the teachers of Porto Rico, and plant improvement.

High school agriculture, D. D. MAYNE and K. L. HATCH (*New York, Cincinnati, Chicago* [1913], pp. 432, figs. 234).—The primary objects of this textbook are stated as to stimulate a real interest in the theory and practice of agriculture, and to furnish a basis for an understanding of the literature of the subject.

A very elementary treatment of agricultural chemistry is given in the first chapter, while the following chapters deal with soils and fertilizers, agricultural botany, economic plants, plant diseases, insects and other small animals of special interest to farmers, farm animals, feeds and feeding, and farm management. The appendix contains among other things tables of feeding standards for daily rations and dates and rates of seed planting in the United States.

Laboratory exercises in secondary school agriculture, 1912, L. B. BOSTON (*[Augusta, Me.]: Ed. Dept.* [1912], pp. 60).—The 81 exercises in this manual cover such subjects as soils, manures and fertilizers, plants, and flowers and seeds. A miscellaneous set of 12 exercises is also given on sprays, weeds, and bacteria. Suggestive questions are offered at the close of each exercise.

Household bacteriology for students in domestic science, ESTELLE D. BUCHANAN and R. E. BUCHANAN (*New York*, 1913, pp. XV+536, figs. 360).—This is a revision of the lectures given during the past 8 years to students in home economics at the Iowa State College of Agriculture and Mechanic Arts.

Syllabus for holiday course for teachers of nature study, 1913 (*Swanley, England: Hort. Col.* [1913], pp. 4).—This is a syllabus of a course in nature study for teachers held from August 2-16, at the Horticultural College, Swanley, Kent, England.

High school extension in agriculture, F. L. WHITNEY (*Amer. School Bd. Jour.*, 46 (1913), No. 5, pp. 15, 16).—This article discusses a successful adaptation of a high school course in agriculture to the needs of the community.

The agricultural instructor is hired for 12 months and his work is so arranged that the afternoons are left free for work among the neighboring farmers. Among the definite lines of extension work conducted may be mentioned seed-testing by the class in agricultural botany. The agricultural class has assisted the farmers in purchasing dairy cows, selecting suitable plots for alfalfa, potatoes, etc., and in planning and constructing several silos. They have also helped to plan definite crop rotations.

A short course is held during December and January, last year closing with a 3-day farmers' institute.

A number of extension meetings have also been held in the neighboring towns and schoolhouses. A talking machine has been used to good advantage in this particular work.

There is a high school cow-testing association, in which the boys of the high school agricultural classes do the collecting and testing of the milk and the farmers the weighing. Some 80 cows are being tested.

The school farm contains 10½ acres and, outside of the benefit gained by the pupils working on it, it is used as a demonstration farm for the benefit of the neighboring farmers.

Educational contests in agriculture and home economics, G. I. CHRISTIE (*U. S. Dept. Agr., Office Expt. Stas. Bul. 255, pp. 47*).—This bulletin outlines forms for 28 different contests and demonstrations, adapted to both sexes and to youths as well as adults, with a view to providing directors in charge of extension work with a somewhat comprehensive collection of different items appropriate for use in contests in agriculture and home economics.

Recent books for the farm home, C. R. GREEN (*Facts for Farmers [Mass. Agr. Col.], 3 (1912), No. 1, pp. 4*).—A list of books of interest to people in rural communities, intended to supplement the list previously noted (*E. S. R., 24, p. 596*).

MISCELLANEOUS.

Annual Report of Florida Station, 1912 (*Florida Sta. Rpt. 1912, pp. CXXIX+XI, figs. 13*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1912, a list of the publications of the year, a general review of the work of the station during the year, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Annual Report of Hawaii Station, 1912 (*Hawaii Sta. Rpt. 1912, pp. 91, pls. 5, figs. 2*).—This contains the organization list, a report by the special agent in charge as to the investigations of the year, reports of the entomologist, horticulturist, assistant horticulturist, assistant chemist, agronomist, the superintendent of the Hawaii substations, and the superintendent of the rubber substation, the experimental work recorded being for the most part abstracted elsewhere in this issue; and an article on The Determination of Sulphur and Chlorin in the Rice Plant, noted on page 231.

Third Annual Report of the Williston Subexperiment Station, 1910 (*North Dakota Sta., Rpt. Williston Substa., 1910, pp. 70, figs. 10*).—This contains an organization list of the North Dakota substations and a report of the work at the Williston substation for 1910. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Fourth Annual Report of the Williston Subexperiment Station, 1911 (*North Dakota Sta., Rpt. Williston Substa., 1911, pp. 64, pl. 1, figs. 6*).—Data corresponding to the above are reported for 1911. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Experiment Station Work, LXXV (*U. S. Dept. Agr., Farmers' Bul. 532, pp. 24, figs. 4*).—This number contains articles on the following subjects: Garden sweet peas, winter-flowering sweet peas, southern bur clover, improving the type of sheep for the Southwest, and combating flies.

Monthly Bulletin of the Department Library, March-April, 1913 (*U. S. Dept. Agr., Library Mo. Bul., 4 (1913), Nos. 3, pp. 67-91; 4, pp. 95-126*).—These numbers contain data for March and April, 1913, respectively, as to the accessions to the Library of this Department and the additions to the list of periodicals currently received.

NOTES

Alabama College.—Charles S. Williamson, jr., assistant professor of chemistry, has resigned to accept an associate professorship of industrial and sugar chemistry in Tulane University.

Arkansas University and Station.—At a meeting of the board of trustees June 28, Martin Nelson, agronomist, was elected dean of the college of agriculture and director of the station.

Georgia Station.—H. P. Lykes has resigned as animal husbandman to accept a position with the Southern Railway in connection with their propaganda work in dairying and poultry raising, with headquarters at Atlanta, and has been succeeded by Perry Van Ewing, assistant in animal nutrition investigations at the Kansas College and Station.

Mississippi College and Station.—J. M. Beal, instructor in botany in the college, has been appointed supervisor of extension courses, P. H. Elwood extension instructor in civic betterment, and A. F. McDougall, a 1913 graduate of the college, instructor in charge of an automobile outfit which is giving demonstrations from town to town of spraying, pruning, milk testing, etc. The college fair exhibit is being materially enlarged.

Michigan College and Station.—J. A. Jeffery of the department of soil physics has resigned to accept a position as agriculturist with the Detroit, South Shore, and Atlantic Railway. R. J. Baldwin has been appointed superintendent of agricultural extension, and R. E. Karraker research assistant in soil physics, vice Dr. George Bouyoucos, resigned.

Mississippi College and Station.—J. M. Beal, instructor in botany in the college, has been appointed plant pathologist in the station.

Nevada University and Station.—L. T. Sharp, instructor in soils in the college of agriculture and in charge of the soils laboratory in the station, resigned July 15 to become assistant professor of soil chemistry and associate soil chemist in the California University and Station.

Oregon College and Station.—A substation has been established at Hood River for the purpose of studying the fruit pests, plant diseases, and other horticultural problems of that section, with J. R. Winston, of the North Carolina College and Station, as plant pathologist. A state appropriation has also been made for a substation in Clatsop County, and it is expected that this will soon be established, with dairying, small fruit growing, and truck gardening as the principal features of the work.

E. L. Potter has been appointed head of the department of animal husbandry, succeeding Director Withycombe, who will devote his entire attention to administrative duties as director. H. F. Wilson has been appointed head of the department of entomology, relieving Dean A. B. Cordley, who will give his whole time as dean of the school of agriculture.

Roy R. Graves, of the Dairy Division of this Department, has been appointed dairyman, vice F. L. Kent, whose resignation has been previously noted. O. M. Nelson, a recent graduate of the University of Wisconsin, is to have charge of the division of sheep husbandry of the animal husbandry department.

ADDITIONAL COPIES of this publication
A may be procured from the SUPERINTEND-
ENT OF DOCUMENTS, Government Printing
Office, Washington, D. C., at 15 cents per copy

Subscription price, per volume of 9 numbers, \$1

EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, PH. D., *Assistant Director*.
Assistant Editor: H. L. KNIGHT.

EDITORIAL DEPARTMENTS.

Agricultural Chemistry and Agrotechny—L. W. FETZER, Ph. D., M. D.
Meteorology, Soils, and Fertilizers—W. H. BEAL.
Agricultural Botany, Bacteriology, and Vegetable Pathology—{W. H. EVANS, Ph. D.
W. E. BOYD.
Field Crops—{J. I. SCHULTE.
G. M. TUCKER, Ph. D.
Horticulture and Forestry—E. J. GLASSON.
Foods and Human Nutrition—{C. F. LANGWORTHY, Ph. D., D. Sc.
H. L. LANG.
Zootechny, Dairying, and Dairy Farming—H. WEBSTER.
Economic Zoology and Entomology—W. A. HOOKER, D. V. M.
Veterinary Medicine—{W. A. HOOKER.
L. W. FETZER.
Rural Engineering—R. TRULLINGER.
Rural Economics—B. B. HARE.
Agricultural Education—C. H. LANE.
Indexes—M. D. MOORE.

RECEIVED
JAN 10 1901
LIBRARY
GARDEN.

CONTENTS OF VOL. XXIX, NO. 4.

Editorial notes:	Page.
Fiftieth anniversary of the American Veterinary Medical Association....	301
Recent work in agricultural science.....	307
Notes.....	396

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Methods in chemical analysis, Gooch.....	307
Determination of potassium with perchloric and cobalti-nitrite methods, Vityn.....	307
Determination of potash as perchlorate in fertilizers, Strigel and Dodd.....	308
Examination and judgment of soils, Hotter et al.....	308
On the carbohydrate group in yam mucin, Oshima and Tadokoro.....	308
The occurrence of formaldehyde in plants, Curtius and Franzen.....	308
Action of hydrogen peroxid on glycerol, Effront.....	309
Action of phosphates on activity of proteolytic enzymes in yeast, Iwanoff.....	309
Determination of volatile fatty acids, Edelstein and Csonka.....	309
Determination of fat by volumetric and gravimetric methods, Wendler.....	309
Errors in determination of cholesterol by Ritter's method, Corper.....	309
Estimation of cholesterol, Mayer and Schaeffer.....	309
Estimation of small quantities of essential oils and spices, etc., Brown.....	309
Determination of lactic acid in presence of protein, Mondschein.....	309
On the accuracy of dry-matter determinations in root crops, Kristensen.....	310
Detection of sucrose in grape juice and wines, Rothenfusser.....	310
The behavior of the peroxidase of cow's milk during heating, Van Eck.....	310
Determination of the water content of cheese, Nockmann.....	311
New butyrometer for determining the fat in cheese.....	311

	Page.
Determination of fat in milk powders, Siegfeld.....	311
Examination and judgment of commercial feed stuffs, von Czadek.....	311
Examination and judgment of feed lime and calcium carbonate, von Czadek..	311
Examination and judgment of ethyl alcohol, Haas.....	312
A new method for preparing alcohol-free fruit and grape wines, Böhi.....	312
Technology of sugar, Dejonghe.....	312
Yearly report on sugar manufacture, Teyssier.....	312
The manufacture of chocolate, Zipperer.....	312
Preservation of foods, Escobar.....	312
Casein: Its preparation and technical utilization, Scherer, trans. by Salter....	312
The strength of textile plant fibers, Dewey.....	312

METEOROLOGY—WATER.

The organization of a meteorological service for agriculture, Broounoff.....	314
Notes on the meteorological bureau of Russia, Broounoff.....	314
Meteorological observations in Bergedorf, 1910 and 1911, Schorr.....	314
Bulletin of the Mount Weather Observatory.....	314
Relation of meteorological study to more logical systems of cropping, Voorhees..	314
Agricultural crops and the weather, Broounoff.....	314
The influence of the moon on the weather, Wagner.....	314
Snow surveys for predicting stream flows, Alter.....	314
Underground water supply of west-central and west Florida, Sellards and Gunter	315
Studies of fish life and water pollution, Clark and Adams.....	315
The efficacy of chlorinated lime in purifying drinking water, Cooper.....	315

SOILS—FERTILIZERS.

The formation, properties, and characteristics of agricultural soils, Facio.....	315
Analysis of Everglade soils, Rose.....	315
Causes of fertility of western Australian semiarid wheat lands, Pfister.....	315
Recent investigations on absorption by cultivated soil, Mayer.....	315
The plant food of soils under the influence of bacteria, Koch.....	315
Decomposition of silicates by soil bacteria, I, Bassalik.....	316
The action of cold on micro-organisms and their activity in the soil, Weber....	316
Tests of a bacteria-inoculating preparation, Bredemann.....	316
A note on the protozoa from sick soils, Martin.....	316
The chemistry of the soil nitrogen, Jodidi.....	316
The error of analysis and the nitrogen economy of soils, Pfeiffer and Blanck...	316
Influence of alfalfa and timothy on nitrates in soils, Lyon and Bizzell.....	317
Summer temperatures of the soil in relation to the supply of nitrogen, Grasby..	317
The effect of ignition on solubility of soil phosphates, Lipman.....	317
The effect of ignition on the solubility of soil phosphates, Fraps.....	317
Fertilization of citrus soils, Smith and Billings.....	317
The influence of stable manure upon the fertility of the soil, Owen.....	317
The conservation of phosphates in the urine, Browning.....	317
The original chemical composition of Peruvian guano.....	318
Some analyses of fish scrap, Lindemuth and Parker.....	318
The menhadden industry, Turrentine.....	318
Nitrate shales, Dunstan.....	218
Influence of calcium nitrate and ammonium sulphate on phosphates, Nedoku- chaev.....	318
The production of ammonium sulphate in 1912.....	318
Aluminum nitrid and the nitrogen problem, Serpek.....	319
Use of sodium bisulphate in preparation of double superphosphate, Periturin..	319
Experiments with phosphatic fertilizers in Uruguay, Schroder.....	319
European imports of phosphate, Memminger, Gaulin, and Skinner.....	319
Experiments to determine effect of potash of phonolite, Hiltner and Lang.....	319
The use of Bohemian phonolite for fertilizing purposes, Seemann.....	319
Origin and formation of the German potash deposits, Boeke.....	319
Prospecting for potash.....	319
Sulphur as a fertilizer, Tritschler.....	3 9
Utilization of the waste from the manufacture of trinitrotoluene, Kochetkov...	319
Value of fertilizing constituents of weeds of Indiana, Mathers and Stapp.....	320
Fertilizers, Rose and Heimbürger.....	320
Analyses of fertilizers, fall season, 1912, Kilgore et al.....	320

AGRICULTURAL BOTANY.

Page.

Form and structure of plant hybrids in comparison with their parents, Brown..	320
On the partial sterility of <i>Nicotiana</i> hybrids, Goodspeed.....	320
Bearing of teratological development in <i>Nicotiana</i> on heredity, White.....	321
Tetraploid mutants and chromosome mechanisms, Gates.....	321
Variation in <i>Lotus corniculatus</i> and <i>Trifolium repens</i> , Armstrong and Horton...	321
Is salinity a factor in the distribution of <i>Nereocystis luetkeana</i> ? Rigg.....	322
Effect of lime on alkali tolerance of wheat seedlings, LeClerc and Breazeale...	322
Antitoxic effect of calcium on some salts in nutritive solutions, Robert.....	322
Starch content as related to geotropism of roots, Block.....	322
Symbiosis of plants as a chemical problem, Zellner.....	323
The influence of manganese on the formation of chlorophyll, Mameli.....	323
On the state of chlorophyll in plants and colloidal chlorophyll, Herlitzka.....	323
The distribution of ions within the plant body, Acqua.....	323
Respiration of plants as hydrolytic oxidation, Palladin.....	324
Absorption of oxygen by respiratory chromogens, Palladin and Tolstaja.....	324
Fluctuations of respiration in foliage leaves in darkness, Meyer and Deleane...	324
Some bacteriological studies of old soils, Sharp.....	325
The activity of bacteria in forest soils, Migula.....	325
The phenomena of fermentation as acts of digestion, Mazé.....	325
How legume plants get their nitrogen, Whiting.....	326
Instructions regarding inoculation from Royal Institute of Agricultural Botany..	326
Chemical treatment of seeds for slow imbibition, Verschaffelt.....	326
The influence of radio-activity on germination, Petit and Ancelin.....	326
The occurrence of callose in root hairs, Ridgway.....	326
The vitality of pollen, Crandall.....	326
Directions for collecting plants, Ricker.....	327
International catalogue of scientific literature. M—Botany.....	327

FIELD CROPS.

Influence of various fertilizer salts on germination of seeds, Rusche.....	327
On the significance of variety tests, Barus.....	329
Deep cultivation, Dumont.....	329
Seeing the light at Anderson, Du Puy.....	329
The work of the Yuma Experiment Farm in 1912, Peterson.....	330
Miscellaneous crops, Peterson.....	330
The work of the Delta Experiment Farm in 1912, Irish, jr.....	330
Field experiments at the moor experiment station, Tacke.....	331
[Field crops], Bersch.....	331
Catch crops, Wibberley.....	331
Cooperative tests of alfalfa from Siberia and European Russia, Hansen.....	331
Alfalfa inoculation tests, Pugsley.....	332
A Mendelian study with beets, Kajanus.....	332
Action of fertilizers on exterior appearance of beets, Roemer and Wimmer....	332
The influence of light on the growth of beet seeds, Strohmer.....	332
Beet seeds, Weiss.....	332
The inheritance of quantitative characters in maize, Emerson and East.....	333
Variety tests of corn, Burgess.....	335
How to grow an acre of corn, Hartley.....	335
American corn growing methods in Bessarabia, Grout.....	335
Local fertilizer experiments with cotton in south Alabama, Duggar et al.....	335
Local fertilizer experiments with cotton in north Alabama, Duggar et al.....	336
The dasheen, a root crop for the Southern States, Young.....	336
Irish potato investigations, 1909-1913, White.....	336
The culture of rice on the Kasai River, Congo Free State, Mestdagh.....	336
The mineral composition of cane at various times of the year, Boname.....	336
Three-year experiment with Squarehead varieties of wheat, Böhmner.....	336
Intensive cultivation of grain, Dumont.....	337
The wild oats (<i>Avena fatua</i>), Zade.....	337
Weeds of cultivated soils, Wehfarg.....	337
The Maryland seed law, Smith.....	337
The control of agricultural seeds in Switzerland, Long.....	337

HORTICULTURE.

[Fruit and vegetable tests at the Yuma Experiment Farm in 1912]. Peterson..	338
The horticultural industry at Ghent, Delmotte.....	338
[Vegetables at Wisley].....	338

	Page.
Cauliflower and cabbage cultivation, Pinn.....	338
Preliminary report on winter cauliflower, Teibout.....	338
Chicory, Grafe.....	338
Tomato variations induced by culture, White.....	339
Orchard management, Hedrick.....	339
Planting trees with dynamite, Farley.....	339
Horticultural research.—III, The action of grass on trees, Pickering.....	339
Smudging costs, Woodbridge.....	339
The setting and dropping of fruits.....	339
Cooperation and fruit growing, McNeill.....	340
Nomenclature of fruit.....	340
The influence of cold on the conservation of the olive, Sani.....	340
Establishment of northern vineyards by American grape stocks, Gervais.....	340
Resistance of coffee to native weed growth and in shade, Bertoni.....	340
Observations on the preparation of cacao, Perrot.....	340
The Philippine coconut industry, Barrett.....	340
Relationship of the false date palm of the Florida Keys, Cook.....	341
[Flowering plants at Wisley].....	341
Bigenetic hybrids between <i>Cooperia</i> and <i>Zephyranthes</i> , Lancaster.....	341
Double flowers, Saunders.....	341
Lilies, Adams.....	341
Household gardens and other enterprises for town and country, Kaup et al.	341
Gardens for small country houses, Jekyll and Weaver.....	341
Insecticides, fungicides, and weed killers, Bourcart, trans. by Grant.....	341
The Arizona horticultural law and its applications, Morrill.....	341
Report of state horticultural commission of Utah, 1910 to 1912.....	342
Rules and regulations for carrying out the plant quarantine act.....	342

FORESTRY.

Alaska woods, their present and prospective uses, Hoffman.....	342
Ecological studies on a northern Ontario sand plain, Connell.....	342
Method of a forest survey and estimate in Nova Scotia, Clark.....	342
The timber lands of Panama, Lindsay.....	342
Some aspects of European forestry, Recknagel.....	342
Report of forest administration in the Andamans for 1911–12, Baker.....	342
Report of forest department of Madras Presidency for 1912, Lushington et al.	342
A new conception on the causes of diameter growth, Jaccard.....	342
Influence of practices on moisture and humus content of forest soils, Tiemann..	343
Winter storage of acorns, Oppermann.....	343
A way to improve the quality of pine seed, Busse.....	343
The growth of red pine in Ontario, Ross.....	343
Observations on cambium development in the American larch, Knudson.....	343
Studies on the anatomical structure of woods of Japanese conifers, Fujioka....	344
Preservative treatment of red-oak and hard-maple crossties, Bond.....	344
Forest products of Canada, 1912.—Pulp wood, Lewis and Boyce.....	344
Forestry literature published in 1912.....	345

DISEASES OF PLANTS.

Diseases of cocoes and other crops, Ashby.....	345
Rot bacteria associated with diseases of tropical plants, Honing.....	345
A new species of <i>Sterigmatocystis</i> , Bainier and Sartory.....	345
<i>Myrioconium scirpi</i> n. g. and sp., Ferdinandsen and Winge.....	345
The extension of <i>Puccinia geranii</i> in geographic-biological races, Magnus.....	345
Report on the wintering over of rust fungi in the uredo stage, Baudys.....	345
Influence of "pickling" on the germination of cereals, Johnson.....	346
Anthraxnose of sisal hemp, Shaw.....	346
Hop mildew, Blodgett.....	346
Diseases and enemies of peanut, Chevalier.....	347
Potato leaf roll due to necrosis of the phloëm, Quanjer.....	347
Silver scurf, a disease of the potato, Melhus.....	347
Fungus diseases liable to be disseminated in shipments of sugar cane, Field....	347
Red rot fungus and the sugar cane in the West Indies.....	347
The fire blight disease in nursery stock, Stewart.....	348
The control of canker in the orchard, Cooper.....	348
Injury to orchard trees by crown gall, Back.....	348

	Page.
The perfect stage of <i>Cylindrosporium</i> on <i>Prunus avium</i> , Higgins.....	349
Causes of deterioration of grapevine in Sicily, I, Petri.....	349
Black rot of grapes, Prunet.....	349
<i>Botrytis cinerea</i> , Lafforgue.....	349
Incubation period of <i>Plasmopara</i> on grapevines, von Istvánffi.....	350
The germination of winter spores of <i>Plasmopara viticola</i> , Ravaz and Verge. . .	350
Banana diseases in Jamaica, Ashby.....	350
The Surinam Panama disease of the Gros Michel banana, Drost, trans. by Ashby.	350
The situation in the citrus district of Batangas, Wester.....	350
A second contribution to the study of gummosis of orange, Bertoni.....	351
Silver thread blight of coffee in Surinam, Kuijper.....	351
Black canker of chestnut, Briosi and Farneti.....	351
Pycnosporos and ascospores of chestnut-blight fungus, Heald and Gardner.....	351
Rubber tree diseases, Petch.....	351
Attempts to grow mistletoe (<i>Viscum album</i>) on monocotyledons, Heinricher...	352
Streak, a bacterial disease of sweet pea and clovers, Manns and Taubenhaus....	352

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Distribution and migration of North American herons and their allies, Cooke..	352
Bibliography of writings of Professor John B. Smith, compiled by Grossbeck...	353
Remarks on some of the injurious insects of other countries, Quaintance.....	353
Insects of Labrador.....	353
Miscellaneous insect pests, Symons and Cory.....	353
A contribution to the morphology and biology of insect galls, Cosens.....	353
The insects affecting sugar cane in Porto Rico, Van Dine.....	353
Mexican sugar-cane insects from Santa Lucrecia, Ulrich and Heidemann.....	353
Injury of tobacco by insects, Schwartz.....	353
Principal insects and diseases of the apple in Georgia, Chase.....	353
Various insects affecting nut trees, Gossard.....	354
Injuries following application of petroleum products to dormant trees, Felt....	354
The effects of oil insecticides on citrus trees and fruits, Yothers.....	354
The success of a two-spray calendar in a Kansas orchard, Hungerford.....	354
The destruction of the locust by its natural enemies, Gallardo.....	354
Notes on tree crickets, Parrott and Fulton.....	354
New Thysanoptera from Florida, Watson.....	354
The false tarnished plant bug on pears, Parrott and Hodgkiss.....	354
Peach "stop back" and tarnished plant bug (<i>Lygus pratensis</i>), Haseman.....	354
The apple leafhopper (<i>Empoasca mali</i>), Haseman.....	354
Fall spraying for the pear psylla, Hodgkiss.....	354
The pear psylla, Parrott and Hodgkiss.....	355
The cotton or melon aphid, Sanborn.....	355
The control of plant lice on apple trees, Hodgkiss and Fulton.....	356
The phylloxera invasion and reconstitution of vineyards in Spain, Janini.....	356
A new California coccid infesting Manzanita, Whitney.....	356
<i>Vanessa californica</i> in California and Oregon during 1911-12, Webster.....	356
Arsenate of lead against the tobacco hornworms, Morgan and Parman.....	356
The maize stalk borer and its control (<i>Sesamia fusca</i>), Moore.....	356
Some notes on <i>Laphygma frugiperda</i> in Porto Rico, Jones.....	356
The 1912 outbreak of <i>Alabama argillacea</i> in Peru, Townsend.....	356
The sugar-cane tingid from Mexico, Heidemann.....	357
<i>Itionida anthici</i> n. sp., Felt.....	357
The wheat fly in central Sweden during 1912, Henning.....	357
Bleeding trees, Felt.....	357
Pellagra and the sand-fly, II, Hunter.....	357
Mosquitoes of North and Central America and West Indies, Howard et al.....	357
Preliminary note on the finding of <i>Hypoderma bovis</i> at Agassiz, B. C. Hadwen...	357
Influence of metamorphosis of <i>Musca domestica</i> upon bacteria, Tebbutt.....	357
Relation of stable fly (<i>Stomoxys calcitrans</i>) to infantile paralysis, Brues.....	358
Tachinidæ and some Canadian hosts, Tothill.....	358
Muscoid parasites of the cotton-stainer and other lygæids, Townsend.....	358
Inquiry into the relationships and taxonomy of the muscoid flies, Townsend..	358
A synopsis of the Sapromyzidæ, Melander.....	358
The Coleoptera of the British Islands, Fowler and Donisthorpe.....	358
The life cycle of <i>Lachnosterna tristis</i> , Davis.....	359
Experiments with Roentgen rays on cigarette beetle, Morgan and Runner.....	359
An enemy of the cigarette beetle, Morgan.....	359

	Page.
<i>Phytonomus meles</i> , Felt.....	359
The Siricidæ of North America, Bradley.....	359
New Ichneumonidea parasitic on leaf-mining Diptera, Gahan.....	359
A new genus and one new species of Chalcidoidea, Gahan.....	359
<i>Scutellista cyanea</i> , bred from <i>Phenacoccus artemisiae</i> , Essig.....	359
An undescribed hymenopterous parasite of the house fly, Richardson, jr.....	359
New Peruvian parasites from <i>Hemichionaspis minor</i> , Rust.....	359
Notes on biology of Rocky Mountain spotted fever tick, Bishopp and King....	359
The red spider on cotton (<i>Tetranychus bimaculatus</i>), McGregor.....	360
<i>Odontopharynx longicaudata</i> n. g., n. sp.—A new form of Anguillulidæ, De Man..	360
An introduction to the study of the Protozoa, Minchin.....	360

FOODS—HUMAN NUTRITION.

The hygiene of diet and the chemical properties of foods, DesRoches.....	360
International review of the literature of food for 1910, Vandeveldt.....	360
Boiled versus raw milk—milk coagulation in the stomach, Brennemann.....	360
Investigation and judgment of anchovy butter, Behre and Frerichs.....	361
Oysters and how to cook them.....	361
The story of a loaf of bread, Wood.....	361
Bermuda arrowroot.....	361
Arrowroot from the Gold Coast.....	361
Tapioca (cassava) flour and starch.....	361
Recipes for the preparation of the dasheen, Young.....	361
Dried bananas.....	361
Cocoa from the Gold Coast.....	361
Bottled pickles, McGill.....	361
Studies of the origin of the caffeols, Grafe.....	361
Concerning a number of foodstuffs of local origin, Adlung.....	361
Food and [other analyses], Rose and Henry.....	362
Report of the food and drug commissioner of Missouri, 1912, Cutler.....	362
Prices, price indexes, and cost of living in Australia, Knibbs.....	362
Report of commission on the cost of living in New Zealand.....	362
Illinois farmers' institute department of household science, edited by McKeene..	362
The universal cook book, Cramp.....	362
A model French kitchen, Osborne.....	362
Some kitchen experiments with aluminium.....	362
Culinary and chemical experiments with aluminium vessels, Glaister and Allison..	363
Our children's health at home and at school, edited by Hecht.....	363
The nutrition coefficient of Antwerp school children, Schuyten.....	364
Notes regarding the diet of the laborer and the mechanic, Otlet.....	365
The utilization of ammonia in the protein metabolism, Taylor and Ringer....	365
Studies in the purin metabolism.—I, Uricolysis, Taylor and Rose.....	365
Destruction by heat of lipoids in food which are essential for life, Stepp.....	365
Relationship of gastric to pancreatic fat digestion, Sedgwick and Schultz.....	365
Relation of meat ingestion to indicanuria in children, Fleixhner.....	365
The rôle of mineral salts in the metabolism of infants, Hoobler.....	366
Nutrient salts—the determination of the ash constituents of foodstuffs, Berg...	366
The mode of behavior of the purin bases of muscles during fatigue, Scaffidi....	366
The content of purin bases in different kinds of muscular tissue, Scaffidi.....	366

ANIMAL PRODUCTION.

By-product feeds, Patterson and White.....	366
Silver beet feeding tests at Belfast freezing works, Macpherson.....	367
Value of sugar beet tops, Bachelier.....	367
Chemical analyses of licensed commercial feeding stuffs, 1912, Woll.....	367
Feeding stuffs and fertilizers licensed for sale in Wisconsin, 1913, Woll.....	367
Feeding stuff control, Hiltner et al.....	367
Feeds and how to judge them by the guaranteed analysis, Page and Hutchins..	367
Feeding experiments, Gerlach.....	367
The utilization of fat in the animal body, Lafon.....	368
Determining the age of cattle, Brandl.....	368
Usefulness of averages in investigations in breeding, Gaude.....	368
The progress of stock breeding in the State of Sao Paulo (Brazil), Misson.....	368
[Live stock in Bosnia].....	368
[Live stock], Penning.....	368

	Page.
A book on cattle raising, De Lapparent.....	368
Steer feeding on Alberta demonstration farms, Craig.....	368
Cattle raising in Tunis.—Crossing zebus with native cattle, Røederer.....	369
Crosses between Algau and African cattle, Spann.....	369
Calf rearing on the emulsion system, Schuppli.....	369
Comparison of different breeds of sheep, Wallace.....	369
Influence of Cheviot on the Kentish sheep, Malden.....	369
[Carcass competition records—sheep], Wallace.....	369
Sheep raising in Ontario.....	369
Production of wool in Spain, Dumont.....	370
Fat lambs at Ruakura, McConnell.....	370
The breeding of sires, Griffiths.....	370
Alfalfa hay for horses, Faville.....	370
Fattening hogs in Alabama, Gray, Summers, and Shook.....	370
Swine feeding experiments with soy-bean meal, Haselhoff.....	371
Cooked pig feed, Spencer.....	371
Embryology of the chick and the pig, Lillie.....	371
The western poultry guide, McAlister et al.....	371
Poultry notes, Waite.....	371
Scientific view of Barred Rock color standard, Hadley and Robinson.....	372
Digestion in the chick, Shaw.....	372
[Food supply for ducks], Mickle.....	373
Successful incubation and brooding, Hurst.....	373
Fur farming in Canada, Jones.....	373

DAIRY FARMING—DAIRYING.

Feeding experiments at agricultural college of Norway, 1911–12, Isaachsen et al.....	373
Maize distillery residues as a feed for milch cows, Weiser.....	374
The utilization of Sudan durra.....	374
Relation of the body weights of dairy cows to their production, Woll.....	374
The milking trials, 1912, Lloyd.....	375
Report of dairymen.....	375
Cow-testing associations, Hibbers and Wolcott.....	375
The present state of dairy cow testing.....	375
The elimination of the unprofitable cow, Wilson.....	375
Report of the dairy commissioner, Marker.....	375
Dairy farming with sheep, Hagemann.....	376
Composition of cow and goat milk, Alpers.....	376
Slime-making bacteria in milk, Thöni.....	376
Pasteurizing milk cheese, Monrad.....	376
[Moisture and fat content of cheese], Gwillim.....	376
“Bankrote” cheese, Teichert.....	376
Brick ice cream, O’Neil.....	376
Yoghourt and its preparation, Hohenadel.....	376
On yoghurt, Schöll.....	377
Yoghourt control, Gabathuler.....	377

VETERINARY MEDICINE.

Ophthalmology for veterinarians, Sharp.....	377
Report of veterinary sanitary board of Denmark, 1911, Grunth and Hansen.....	377
Report of the National Serum Institute of Holland, Poels.....	377
Vaccine and serum therapy, Annett.....	377
Methods of sero-diagnosis applicable to diseases in South Africa, Kehoe.....	377
The sero-diagnosis of pregnancy, Rosenthal.....	377
The epithelial bodies of the thyroid and the accessory thyroid, Bartz.....	377
A chemical study of the liver of the bovine, Daniel-Brunet and Rolland.....	377
Some further studies in regard to pollen toxin, Kammann.....	377
In regard to the properties of pyocyanase, Isabolinsky.....	378
Antihog erysipelas and antianthrax serum, Patzewitsch and Isabolinsky.....	378
The detection of anthrax with the precipitation method, Schütz and Pfeiler.....	378
Ascoli’s thermoprecipitin reaction for diagnosing anthrax, Floris.....	378
The cause for the natural immunity against the anthrax bacillus, Kodama.....	378
On eczema in the horse and bovine, Mörlers.....	378
Protective and curative vaccination against foot-and-mouth disease, Loeffler.....	379
The Negri bodies in rabies, Watson.....	379

	Page.
Chemotherapeutic trypanosome studies and immunity following cure, Terry...	379
A new method for immunizing against trypanosome diseases, Schilling.....	380
A new culture medium for the tubercle bacillus, Valletti.....	380
Cultivating tubercle bacilli from human and animal organs, Wedensky.....	381
The nutrition of the tubercle bacillus with mineral substances, Sauton.....	381
The viability of the bovine type of tubercle bacilli, Titze.....	381
Children infected with bovine type of bacillus, Weber and Steffenhagen.....	382
Tuberculosis in nursing children, Steffenhagen.....	382
Investigations in regard to tubercle bacilli of various origins, Steffenhagen...	382
The type of bacillus present in the sputum of tubercular subjects, Lindemann...	382
Tuberculous animals and the part they play in infection of man, Calmette.....	382
The tuberculous cow in relation to human health, Reynolds.....	382
Value of the meiostagmin reaction for diagnosing tuberculosis, Roncaglio.....	382
Differentiation between human and bovine types of tubercle bacillus, Fraser..	382
Tuberculin testing of cattle, Chrisman.....	383
Detection of tubercle bacilli in the excreta of suspected bovines, Titze.....	383
The detection of the tubercle bacillus in the feces of bovines, Thieringer.....	384
Report on Heymans' method for vaccinating against bovine tuberculosis.....	384
The treatment of bovine tuberculosis with Tuberculosan (Burow), Perlich.....	384
The question of tick eradication, Bahnsen.....	384
<i>Cooperia oncophora</i> in diarrheic calves, Pillers.....	384
Hog cholera, Bolton.....	384
Injection experiments with salvarsan in pectoral influenza of horse, Teppig...	385
Bacteriological investigations of tuberculosis in the horse, Zwick and Zeller...	385
Canine anaplasmosis, Basile.....	385
Important poultry diseases, Salmon.....	385
Variations in a chicken sarcoma caused by a filterable agent, Rous and Murphy..	285

RURAL ENGINEERING.

Third biennial report of the department of engineering of California.....	386
Construction of the Kachess dam, Washington, Baldwin.....	386
A method of proportioning concrete, Hunter.....	386
Effect of too much water in mixing concrete.....	386
Protection of concrete structures from alkali and other agents, D'Rohan.....	386
Tests of grouting gravel in river beds, Cartwright.....	387
Bending strength of yellow-pine timber, Morgan.....	387
Roads and road materials of Florida, Sellards, Gunter, and Cox.....	387
Specifications for street roadway pavements, Whinery.....	387
Comparative statistics on cost of road construction.....	387
Repair and maintenance of highways, Hewes.....	388
Good roads yearbook.....	388
Horse, truck, and tractor, Casson, Hutchinson, jr., and Ellis.....	388
[The traction gear].....	389
The pulling power of slack belts, Kent.....	389
The indicator for steam traction engine testing, Wiggins.....	389
Calculating speeds, Kranich.....	389
Cost of pulling small trees with a traction engine, Hutchinson.....	389
The Port Elizabeth farm tractor and plow trials.....	390
Text of a centrifugal hand separator, Rezek and Winkler.....	390
[Rope], some knots and splices, Drew.....	390
A general purpose barn, Chase.....	390
The elements of heating and ventilation, Greene, jr.....	390

RURAL ECONOMICS.

Profitable and unprofitable farms in New Hampshire, Robertson and Dodge...	391
Efficient types of farming and their location, Brinkmann.....	391
Agrarian matters and agrarian politics, Wygodzinski.....	391
Land taxation, Eichholtz.....	391
[German agricultural associations and organizations], Kiessling.....	392
A successful cooperative exchange, Ingling.....	392
How cooperation remade a Minnesota neighborhood, Poe.....	392
The road to cheaper money, Hughes.....	392
Land mortgage credit system in America, Price.....	393
The introduction and organization of real credits in Württemberg.....	393
Agricultural statistics of Belgium in 1912.....	393
Trade unionism, unemployment, prices, etc., in Australia, 1891-1912, Knibbs..	393

AGRICULTURAL EDUCATION.

	Page.
Fifth Report of Rural Education Conference on courses in agricultural colleges.	393
Agricultural and industrial work in the schools of Hamilton County, Haines...	394
Boys' and girls' agricultural clubs in Massachusetts, 1913, Hart.....	394
Manual of uniform course of study for the elementary schools of Ohio, Miller..	394
[Nature study lessons].....	395
Helps for club members.....	395
[Oklahoma boys' and girls' junior agricultural clubs].....	395
[Papers on gardening], Wilkinson.....	395
Soil studies, Mairs.....	395
Instructions for corn club work, Wiancko.....	395
Potato culture, Green.....	395
A sorghum primer for rural schools and farmers, Leidigh.....	395
Varieties of apples for Ohio, Green.....	395
Orchard cover crops, Paddock.....	395
Arbor Day annual, 1913, compiled by Wiley.....	395
An entomological collection for common schools, Troop and Mason.....	395
Judging eggs, Philips.....	395

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

Stations in the United States.

Alabama College Station:	Page.
Bul. 168, Dec., 1912.....	370
Bul. 169, Jan., 1913.....	335
Bul. 170, Feb., 1913.....	336
Louisiana Stations:	
Bul. 140, May, 1913.....	338
Maryland Station:	
Bul. 168, July, 1912.....	366
Bul. 169, Aug., 1912.....	375
Bul. 170, Oct., 1912.....	337
Bul. 171, Dec., 1912.....	371
Bul. 172, Jan., 1913.....	336
Bul. 173, Jan., 1913.....	339
Bul. 174, Feb., 1913.....	384
Bul. 175, Mar., 1913.....	353
Mississippi Station:	
Tech. Bul. 3, Jan., 1913.....	320
Nebraska Station:	
Bul. 136, Apr. 10, 1913.....	332
Research Bul. 2, Apr. 1, 1913..	333
New York Cornell Station:	
Bul. 328, Mar., 1913.....	346
Bul. 329, Apr., 1913.....	348
New York State Station:	
Circ. 20, Jan. 22, 1913.....	355
Circ. 21, Feb. 10, 1913.....	354
Circ. 22.....	339
Circ. 23, Mar. 4, 1913.....	356
Circ. 24, Mar. 20, 1913.....	339
Oklahoma Station:	
Bul. 98, Aug., 1912.....	355

Stations in the United States—Continued.

South Dakota Station:	Page.
Bul. 141, Jan., 1913.....	331
Wisconsin Station:	
Circ. Inform. 42, Apr., 1913..	367
Circ. Inform. 43, Mar., 1913..	367
Wyoming Station:	
Bul. 98, Apr., 1913.....	370
<i>U. S. Department of Agriculture.</i>	
Circ. 44.....	342
Farmers' Bul. 530.....	385
Farmers' Bul. 537.....	335
Bureau of Biological Survey:	
Bul. 45.....	352
Bureau of Entomology:	
Circ. 172.....	360
Circ. 173.....	356
Forest Service:	
Bul. 126.....	344
Bureau of Plant Industry:	
Circ. 126.....	327, 330, 333, 347
Circ. 127.....	330, 336, 347, 361
Circ. 128.....	312, 391
Weather Bureau:	
Bul. Mount Weather Observ., vol. 5, pt. 5.....	314
Office of Public Roads:	
Bul. 48.....	388

EXPERIMENT STATION RECORD.

VOL. XXIX.

SEPTEMBER, 1913.

No. 4.

The fiftieth annual meeting of the American Veterinary Medical Association, which was held at the Hotel Astor, New York City, from September 1 to 5, marks an epoch in the history of veterinary medicine, a profession which is intimately interwoven with the art of agriculture. It is now more than fifty years since, on June 9, 1863, the first meeting was held at the Astor House by a small group of veterinarians for the purpose of forming the United States Veterinary Medical Association. Of this group of men the only one alive to-day is Dr. Alexander Liautard, now of Paris, one of the founders of the New York-American Veterinary College, which, under a new charter, has recently been declared the state veterinary college of eastern New York and is affiliated with New York University.

Some of the notable advances which the veterinary profession has achieved during the past half century were briefly referred to by Dr. John R. Mohler, of this Department, in his presidential address to the association. As he pointed out very aptly, "the acquirement of knowledge in the domain of animal diseases during the last five decades has been constant and amazing and compares favorably with the progress in other branches of science which has attracted the admiration of the world. . . . What a revolution in veterinary thought and practice has resulted can be appreciated only by comparing the text-books of twenty-five years ago with those of the present day." Much of this advance dates from the classic experiments of Pasteur, who, working on the theory that resistance to a disease could be produced by causing a mild attack of the affection, was able to secure immunity against a number of diseases of the lower animals, notably anthrax and rabies.

In the upbuilding of veterinary medicine in America from a more or less empirical doctoring of animals to a well-recognized science, the American Veterinary Medical Association has been a conspicuous agency, and its membership may well be congratulated upon the substantial progress which they have helped to promote. The Association of Veterinary Faculties and Examining Boards of North

America, which held sessions during the convention, has also been a helpful influence during its briefer career.

Another important factor in the advancement of veterinary science has been the United States Department of Agriculture. It was Drs. D. E. Salmon and Theobald Smith of this Department who, in December, 1885, began a series of experiments which resulted in clearly establishing that the injection of sterilized cultures of micro-organisms confers an immunity to a subsequent infection with living virulent organisms. Our present knowledge of vaccine therapy rests upon this work, and it has found a large range of usefulness in treating both human and animal diseases. Texas fever appeared in the United States in 1868, causing great losses and much excitement in the agricultural and live stock industries, but when Salmon, Smith, and Kilborne had determined the cause of the disease and its mode of transmission through the agency of the cattle tick, its ultimate control became a matter for confident prediction. The demonstration that disease could be transmitted by insects was also of great benefit to public health, especially by stimulating investigations of the part played by the mosquito in spreading malaria and yellow fever from man to man.

In recent years as well, no small share of the success of veterinary medicine, especially in controlling outbreaks and eradicating disease, has been due to the activities of the Bureau of Animal Industry, and many of the serological and immunity investigations and the results obtained therefrom may be directly attributed to the stimulus furnished by this Bureau. It has also been of great service through its influence upon other institutions. In the opinion of Dr. Mohler, "no one factor has been more successful in elevating the standard of veterinary institutions in America than the investigation of their curricula and equipment by the Bureau of Animal Industry in conjunction with the United States Civil Service Commission. While the primary object of such supervision was to make it possible for the Government to obtain men better educated and better qualified for its veterinary work, it nevertheless succeeded in raising the standard of veterinary education in the United States and enabled the students to obtain greater and better facilities for study."

Obviously the full benefits of these advanced educational qualifications can not be directly estimated, but one striking result has been the steady rise of the veterinary profession in dignity and distinction. Veterinary colleges as a class now have a well-recognized educational status, and the public is learning to discriminate between their graduates and the quacks and charlatans with whom "horse doctoring" was once popularly associated. In most States comparatively stringent requirements now regulate the practice of veterinary medicine and protect alike the public and the well-qualified

expert. Moreover, the prospective veterinary graduate is no longer restricted to the work of a practitioner for a career, as he finds open to him numerous other avenues of promise and honor. Aside from the ever-widening field of instruction and research, such openings as the meat inspection work of this Department or of States and municipalities, the veterinary service of the Army, and the inspection of cattle and stables in connection with the regulation of milk supplies may be cited as typical of the opportunities practically unheard of a generation ago but now available in increasing number and attractiveness.

The agricultural colleges and experiment stations have been still another important factor in veterinary progress in this country. It is of much interest to note that one of the first American veterinarians to realize the intimate relations of veterinary science to agricultural instruction seems to have been Dr. Liautard, who stated in his presidential address to the association in 1877 that "the importance of veterinary science now begins to be felt all over the United States and its vital influence upon the general welfare of live stock is soon recognized by agricultural schools." Veterinary instruction had, in fact, already been established for some time in a number of these institutions. As early as 1868 courses were being given in the agricultural departments of the Illinois Industrial, now the State, University, and of Cornell University. A year later the Massachusetts Agricultural College included the subject in its curriculum. By 1877 veterinary science was also being taught in the agricultural colleges of Ohio, Maryland, Pennsylvania, New Hampshire, Iowa, and Vermont, as well as in the Bussey Institution of Harvard University. This list of institutions has gradually been lengthened, and to-day eight agricultural colleges are giving full courses in veterinary medicine leading to a degree, while forty-four are offering lectures or other work either as an integral part of their agricultural instruction or as a preparatory course for the further study of the subject.

A similar development has taken place in experiment station work. In 1889 there were about twenty veterinarians connected with the stations. In 1899 this number had increased to twenty-eight, in 1909 to about forty-seven, and in 1912 to about sixty-eight. In most cases these men were members of full-fledged departments, and some of the stations now require the entire time of several veterinarians. Obviously, this represents a great advance over the early days, when the duties of the station workers were much less clearly defined and it was not uncommon for the veterinarian to be called upon to attend the sick stock of the farmers located in the vicinity or even in distant parts of the State. Such practice, of course, would have rendered impossible of accomplishment any plans for research worthy of the name. Fortunately, such conditions are now exceptional. This is

due in part to the better understanding of the function of the experiment station by the farmer, the many urgent demands upon the veterinarian in direct connection with the teaching and research work, and finally to the stringent requirements of the research work conducted under the Adams Act.

In this connection it is interesting to note that during 1906, the first year in which grants were made under the Adams fund, there were twenty projects accepted as feasible for veterinary research or related thereto, while in 1913 the projects in progress numbered about fifty. Some of the projects have already been satisfactorily completed. Interesting results have also been obtained under the Hatch Act and from other funds. Some of these concern veterinary medicine directly and others are intimately connected with it, although primarily chemical, physiological, or public health problems.

One of the most interesting developments of recent years has been the increasing realization by the veterinary profession itself of the need of more adequate training in the agricultural colleges and other institutions. Of late the strong demand for more accurate and fundamental research work has likewise been most encouraging.

Perhaps no one factor has done more to impress upon veterinarians engaged in research this need of a broad scientific training than the discovery of the complexity of many of their most important problems and of their close relationships with other sciences. Some of these phases were well illustrated at the recent meeting of the association. For instance, one of the features of the convention was the symposium on forage poisoning in horses, or so-called equine cerebrospinal meningitis, in which the section on sanitary science and police and the section on veterinary medicine participated. In the discussion a number of veterinarians engaged in experiment station, college, or state work took part, and much prominence was given to the theory that the disease is caused by moldy feed or fodder otherwise contaminated with micro-organisms, etc. The relations of the enzymes as factors in producing toxic products, such as the liberation of hydrocyanic acid from glucosids through the agency of emulsin-like enzymes, were also considered. The discussion made it very apparent that veterinarians who intend to keep up with the various diseases to which live stock is subject must not only be trained in the laboratory and clinical branches of veterinary medicine as they are taught in most colleges to-day, but also that they must give increased attention to the biological sciences, such as biological chemistry, pharmacodynamics, botany (cryptogamic as well as phanerogamic), and zoology. This is especially true of those who intend to engage in experiment station and other research work where the standard of requirement is bound to become high.

Contagious abortion in cattle, a disease which entails a great deal of loss in the cattle and dairy industries, was another subject to receive prolonged discussion. It was shown that this subject was not only of direct importance to these industries but also of possible concern in the realm of public health, inasmuch as the *Bacterium abortus* has been detected by Schroeder and Cotton in many of the market milks collected in the District of Columbia. As was pointed out by Dr. Mohler, "the work done in the domain of infectious diseases has shown how advantageous and even necessary is the cooperation of the veterinarian and the physician."

That such an association must exist was also illustrated in the addresses with reference to tuberculosis. It is likewise interesting to note that recently it has been reported that hog cholera may affect man. How prominent a factor veterinary medicine is becoming in the control of public health is shown by the fact that veterinarians are being appointed in increasing number as members of local and State health boards, and that some are occupying positions in municipal and State bacteriological laboratories or as instructors in colleges teaching human medicine.

The situation with reference to hog cholera affords still another illustration prominently before the association. Although classical researches have been made in regard to hog cholera by Dorset, Niles, and McBryde in the laboratories of this Department, and much has been accomplished by Federal and State veterinarians and others in the way of checking and eradicating this disease, there is still much difference of opinion as to the precise causative agent, and a great deal of work is under way regarding it.

During the last two years there have appeared from time to time in various scientific journals articles by Dammann and Stedefeder, Pfeiler, King, von Betgh, and others, dealing with the occurrence of organisms in the blood and tissue of cholera hogs. Some of the workers in this field have employed improved pieces of apparatus, such as the ultramicroscope and ultrafilter, while others have utilized the methods germane to the usual bacteriological work. The method of vaccinating against rinderpest has suggested a way for protectively vaccinating against hog cholera, and in the same way some recent researches in other lines have afforded avenues for again attacking the problem. For instance, only recently it has been reported that a globulin plays a part in fowl cholera, and it was not very many years ago that it was shown that a globulin contains much of the active principles of diphtheria antitoxin. Whatever may be the ultimate conclusion, from what has been said it is very apparent that the veterinarian who studies the disease further must resort to all available means at his command, and that very likely he will find

it necessary to call in others skilled in the use of the exact scientific methods of biology, pathology, and biological chemistry.

Of the other infectious diseases glanders may be mentioned as one which has occasioned the loss of a great many animals and of thousands of dollars, yet Mohler and Eichhorn have only recently reported that to-day there is no effective method for immunizing against this disease. The same must be said of tuberculosis and of many other diseases.

For these, and a host of other unsolved problems, research work of a high grade is urgently needed. So vast are our live stock interests and so intimately associated with them the vital considerations of public health, that few fields of endeavor are of greater intrinsic importance or afford greater opportunities for service to-day. It will therefore be fortunate if the veterinary profession will continue to prepare itself to combat these complex problems by insisting upon sound fundamental training for its research workers, and by still further availing itself of all the assistance possible from workers in the related sciences. In such ways the marked progress of the past fifty years may be consistently maintained and results of even greater value may confidently be expected.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Methods in chemical analysis, F. A. GOOCH (*New York and London, 1912, pp. XII+536, figs. 29*).—This is a compilation of methods of chemical analysis, originated or developed in the chemical laboratory of Yale University. Following a chapter on appliances and general procedures used in analysis, the various elements are considered in turn.

Determination of potassium with the perchloric acid and sodium cobaltinitrite method, A. VITYN (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 2, pp. 192-199*).—Potassium was determined in a mixture of potassium and sodium chlorids 7:3, soils, and red clover seeds. Each sample contained 0.07 gm. of potassium chlorid, except the seeds, the ash of which contained only 0.04 gm. In soils the potash determinations were made in 10 per cent hydrochloric acid extracts. The organic matter was removed previously by ignition and SO_3 , P_2O_5 , Al_2O_3 , Fe_2O_3 , CaO , and MgO were separated by the methods used at the Agricultural Chemical Laboratory at St. Petersburg. For the determination of potash in the clover seeds the organic matter was removed by heating with a mixture of nitric and sulphuric acids.

In determining potassium with perchloric acid the aqueous solution of the sample was evaporated to a bulk of from 15 to 20 cc. and 5 cc. of perchloric acid of specific gravity 1.125 was added dropwise. Heating on the water bath was continued until the white fumes of perchloric acid disappeared. On cooling 15 cc. of 95 per cent alcohol was added and the solid contents were carefully triturated with a glass rod. The alcohol was then poured off through a Gooch crucible, the precipitate was washed 2 or 3 times by decantation with 95 per cent alcohol, containing 0.2 per cent of perchloric acid, and transferred to a Gooch crucible in which it was washed 3 or 4 times more with the same alcoholic solution. Finally the precipitate KClO_4 was treated with a little pure alcohol, dried for an hour at from 120 to 130° C., and weighed. The results agreed very satisfactorily with those obtained with platinic chlorid. It is deemed important that all free perchloric acid be completely expelled.

The determination of potash by the sodium cobalti-nitrate method was made according to Drushel's method with some modifications, i. e., decinormal solutions of potassium permanganate and oxalic acid were used. The latter contained 50 cc. of strong sulphuric acid as indicated by Drushel, but in place of ammonium oxalate pure crystalline oxalic acid was used. The precipitated $\text{KNa}_2\text{Co}(\text{NO}_2)_6$ was frequently stirred during evaporation and 2 cc. of 15 per cent acetic acid was added, 1 cc. at a time. The washing was done with a semi-saturated solution of sodium chlorid which was then removed by washing 3 times with water. For filtering, hardened filter paper held in a glass funnel (S+S, 9 cm. No. 575) is preferred to a Gooch crucible. The operation is somewhat slower, but the results are somewhat nearer to those obtained by precipitating with platinic chlorid.

While the results obtained by both methods are satisfactory the perchloric acid method is deemed simpler and quicker.

The determination of potash as perchlorate in potash fertilizers, A. STRIGEL and J. DODR (*Landw. Vers. Stat.*, 78 (1912), No. 3-4, pp. 179-188).—The authors find that the best results are obtained with this method if the potassium perchlorate solution is evaporated to sirupy consistency. While the figures obtained agree well with those given when evaporated to complete dryness the latter show a tendency to be a little higher, and still higher if the drying is continued on a boiling water bath. Heating over 100° yields erroneous figures. The presence of free hydrochloric acid, even in small amounts, was found to influence the results markedly. In a series of tests it was soon noted that when this acid was present in the perchlorate mixture, alcohol when added acts upon some of the perchlorates ($\text{Ba}(\text{ClO}_4)_2 + 2\text{HCl} = \text{BaCl}_2 + 2\text{HClO}_4$), producing chlorid which is weighed and consequently produces erroneous results.

The following procedure is recommended: Place 10 gm. of the potash fertilizer in a $\frac{1}{2}$ liter bottle with about 100 cc. of water and 2 cc. of hydrochloric acid (specific gravity 1.125); bring to the boiling point, heat for 5 minutes, and precipitate the sulphuric acid with barium chlorid, avoiding an excess of the latter. After cooling fill to the 500 cc. mark and filter. Take 25 cc. of the filtrate, which corresponds to 0.5 gm. of the original fertilizer, in a glass dish with 10 cc. of perchloric acid (22 per cent), and evaporate to sirupy consistency. Treat the residue in the usual manner, collect the potassium perchlorate in a Gooch crucible, and dry at 130° C.

Examination and judgment of soils, HOTTER ET AL. (*Ztschr. Landw. Versuchsw. Österr.*, 15 (1912), No. 8, pp. 1002-1019).—After briefly reviewing the factors involved in soil formation and soil fertility a description of the mechanical and chemical methods for examining soils adopted by the Association of Austrian Experiment Stations is given. The section on mechanical analysis describes the elutriation and sifting methods. The chemical methods deal with those for determining the plant nutrients, such as nitrogen, phosphoric acid, potash (by the perchloric acid method), and calcium. Special methods are given for water, carbonates, sand, clay, humus, water capacity (E. S. R., 26, p. 218), hygroscopicity, reaction, and the determination of substances injurious to plants. The latter methods include some for free acid, sodium chlorid, sulphates, and iron in ferrous combination. Methods of sampling are also presented. The remainder of the article deals with the interpretation of the data obtained by the above mentioned methods, the reagents and apparatus necessary for examining soils, and forms for reporting results.

On the carbohydrate group in yam mucin, K. OSHIMA and T. TADOKORO (*Jour. Col. Agr. Tohoku Imp. Univ.*, 4 (1911), No. 6, pp. 243-249).—As the occurrence of mucin in the vegetable kingdom has not been fully determined, an analysis was made of what is considered yam mucin. Cinchonin norisaccharate was obtained, demonstrating positively the presence of the glucosamin group.

The occurrence of formaldehyde in plants, T. CURTIUS and H. FRANZEN (*Ber. Deut. Chem. Gesell.*, 45 (1912), No. 9, pp. 1715-1718; *abs. in Zontbl. Biochem. u. Biophys.*, 13 (1912), No. 16-17, p. 649).—Finding that the usual method proposed for detecting formaldehyde in plant leaves reacted with aldehydes other than formaldehyde such as α , β -hexylenaldehyde, the authors made some experiments with dog-rose leaves for the purpose of finding an appropriate method. It was discovered that if the volatile acids were first removed from the dog-rose leaves the aldehydes could be converted into their respective acids by shaking with silver oxid. The acids so obtained were then estimated

by the mercuric chlorid method and also from the amount of carbon dioxide produced from these acids when treated with concentrated sulphuric acid. From 180 gm. of dog-rose leaves were obtained 0.155 gm. of formaldehyde.

Action of hydrogen peroxid on glycerol, J. EFFRONT (*Bul. Soc. Chim. France*, 4. ser., 11 (1912), No. 14, pp. 744-747; *abs. in Jour. Soc. Chem. Indus.*, 31 (1912), No. 16, p. 782).—Glycerol is quantitatively oxidized to formic acid, each molecule of glycerol yielding 2 molecules of formic acid. The intermediate products are glyceric acid and glycollic acid.

The action of phosphates upon the activity of the proteolytic enzymes in yeast, N. IWANOFF (*Ztschr. Gärungsphysiol.*, 1 (1912), No. 3, pp. 230-252).—This work has been previously noted from another source (*E. S. R.*, 27, p. 108).

The qualitative and quantitative determination of volatile fatty acids by the steam distillation method, F. EDELSTEIN and F. v. CSONKA (*Biochem. Ztschr.*, 42 (1912), No. 5, pp. 372-392; *abs. in Zentbl. Biochem. u. Biophys.*, 13 (1912), No. 18-19, p. 728).—By means of various distillation methods described by Welde (*E. S. R.*, 25, p. 413) and fractional precipitation as silver salts the volatile fatty acids can be accurately determined. The method can be safely used for milk, stomach and intestinal contents, and other animal and vegetable substances, providing the material under examination does not contain other substances which react with silver nitrate.

Comparative determination of fat by the volumetric and gravimetric methods, O. WENDLER (*Molk. Ztg. [Hildesheim]*, 26 (1912), No. 79, pp. 1491, 1492).—These tests, which were made with cheese, showed that the gravimetric method yields results which are 0.5 per cent higher than the volumetric method (acid butyrometric). In the volumetric method 2.5 gm. cheese and sulphuric acid (specific gravity 1.69) were employed. Amyl alcohol was dispensed with.

Errors in the quantitative determination of cholesterol by Ritter's method: The influence of autolysis upon cholesterol, H. J. CORPER (*Jour. Biol. Chem.*, 11 (1912), No. 1, pp. 37-45).—"A source of error was found in the quantitative estimation of cholesterol by the Ritter method in the fact that the presence of an excess of sodium alcoholate over that necessary for the saponification of the fats and esters prevents a complete extraction of the cholesterol from the salt mixture by means of ether. This error may vary from 5 to 20 per cent in the case of a normal tissue when there is an excess of from 1 to 3 cc. of a 5 per cent sodium alcoholate solution used in the saponification of 1.5 gm. of the alcohol-ether extract. The Ritter method for the quantitative determination of cholesterol in tissues should be used only with certain restrictions and precautions in mind.

"No marked change was found in the amount of cholesterol present in the dog spleen after in vitro and in vivo autolysis of short duration. The steer spleen contains about 0.4 per cent of its moist weight as cholesterol."

Estimation of cholesterol by the Kumagawa-Suto and Windaus methods, A. MAYER and G. SCHAEFFER (*Compt. Rend. Soc. Biol. [Paris]*, 72 (1912), No. 9, pp. 362-364; *abs. in Zentbl. Expt. Med.*, 1 (1912), No. 14, pp. 625, 626).—The authors found that a combination of these two methods would yield the best results.

The estimation of small quantities of essential oils and spices, etc., J. A. BROWN (*Analyst*, 37 (1912), No. 432, pp. 88-90).—Continuing previous work (*E. S. R.*, 24, p. 512), the author reports some further results with the essential oil from coriander, cardamom, rosemary, eucalyptus, anise seed, bay, juniper berries, cedar, sandalwood, origani, black pepper, and pimento.

Quantitative determination of lactic acid in the presence of protein substances, J. MONDSCHIEIN (*Biochem. Ztschr.*, 42 (1912), No. 2-3, pp. 105-123; *abs. in Zentbl. Biochem. u. Biophys.*, 13 (1912), No. 18-19, p. 729).—The lactic

acid content of muscle extracts prepared by boiling can be determined with sufficient accuracy by titration, using phenolphthalein as the indicator. The other acids present, which include small amounts of β -oxy butyric acid, can be neglected. The lactic acid retained by the coagulum can be determined by liquefying the coagulum with potassium hydroxid solution, removing the alkali albuminates, and determining the lactic acid in the filtrate according to the v. Fürth and Charnass method (potassium permanganate in a sulphuric acid solution).

On the accuracy of dry-matter determinations in root crops, R. K. KRISTENSEN (*Tidsskr. Landbr. Planteavl*, 19 (1912), No. 2, pp. 326-334).—By making triplicate determinations, weighing out about 15 gm. of the pulp, and drying directly, without addition of pumice stone or stirring with a glass rod, the average error of analysis in from 252 to 420 samples amounted to 0.026 per cent for mangels, 0.036 for ruta-bagas, 0.033 for turnips, and 0.03 for carrots.

Detection of sucrose in grape juice and wines, S. ROTHENFUSSE (Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 1-2, pp. 93-104; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 16, pp. 789, 790).—In grape juice, 5 cc. of the juice is added to a solution of 6 gm. of barium hydroxid in 25 cc. of water to which has been added 25 cc. of a 3 per cent solution of hydrogen peroxid. The mixture, contained in a glass or nickel basin, is heated on a water bath for 20 minutes and if, during heating, a yellow color is developed, hydrogen peroxid solution is added drop by drop until the color is destroyed. The liquid is filtered and 5 cc. of the filtrate is heated in a boiling water bath with an equal volume of the diphenylamin reagent (a solution prepared by adding 20 cc. of a 10 per cent alcoholic solution of diphenylamin to 60 cc. of glacial acetic acid and 120 cc. of concentrated hydrochloric acid). In from 7 to 8 minutes a strong blue color is developed if only from 0.1 to 0.2 per cent of sucrose is present in the original juice. After more prolonged heating, some juices, known to be free from sucrose, give a slight coloration, but this can not be mistaken for the color developed when sucrose is present.

“Dry wines:—Ten cc. of the wine is added to 50 cc. of a 5 per cent barium hydroxid solution which has been mixed with 10 cc. of a 3 per cent hydrogen peroxid solution, and the test is proceeded with as described for grape juice. It is not necessary to remove the color of red wines, as this is destroyed in carrying out the test, and if the wine is unusually acid it can be neutralized by using a sufficient excess of barium hydroxid solution.

“Sweet wines:—Ten cc. of the wine is shaken with 50 cc. of acetone and the cloudy solution is filtered, a pinch of purified kieselguhr having been added to assist clarification. Thirty cc. of the filtrate is mixed with 30 cc. of water, and the mixture is heated on a water bath until the acetone has been driven off. Six gm. of barium hydroxid and 25 cc. of a 3 per cent hydrogen peroxid solution are added, and the whole stirred until the barium hydroxid is dissolved. If a yellow color is developed it is removed by small additions of hydrogen peroxid and after heating for 20 minutes the liquid is filtered. Five cc. of the filtrate is shaken with 5 cc. of dilute sulphuric acid and 5 cc. of the diphenylamin reagent, and the mixture heated for 8 minutes in a boiling water bath. On allowing the separated barium sulphate to settle, the clear liquid will be of a strong blue color if sucrose is present. As almost all sweet wines, from a cause which has not yet been investigated, give a weak coloration, equal to that produced by from 0.02 to 0.1 per cent of sucrose, such weak indications must be neglected.”

The behavior of the peroxidase of cow's milk during the process of heating, J. J. VAN ECK (*Chem. Weekbl.*, 8 (1911), No. 37, pp. 691-702, figs. 2).—

This is a study of the various factors which influence the results of the peroxidase tests obtained in milk. Thirty-four samples of milk were examined in this connection with a special form of apparatus constructed by the author. The apparatus consists of a 700 cc. Woulf bottle with 3 openings (one containing a 0.1° thermometer, the second holding an agitator which is operated with a hot air engine, and the third a glass tube which serves as an opening for introducing a pipette for sampling the milk during the various stages of the process), surrounding by a water jacket and a toluol thermoregulator. The apparatus is heated by a Bunsen burner.

In determining the temperature at which the reaction is extinct, it was noted that the Storch reagent gave varying results. This is due to the various methods which are utilized in applying the test, and also depends upon the composition of the reagent. The rapidity with which the sample is heated, the composition of the milk, and the acidity are all factors which influence the test, particularly the color produced by the reagent.

Determination of the water content of cheese, E. NOCKMANN (*Molk. Ztg. [Hildesheim]*, 27 (1913), No. 2, pp. 27, 28).—This is a study comparing the Mai and Rheinberger test (*E. S. R.*, 28, p. 612) with the drying method, i. e., in a platinum dish without sand. The highest results were obtained with the Mai-Rheinberger method, and this is therefore given the preference because the operation can be conducted in less time and requires only one weighing.

New butyrometer for determining the fat in cheese (*Molk. Ztg. [Hildesheim]*, 27 (1913), No. 4, pp. 68, 69, fig. 1).—This is a description of a modified butyrometer for determining the fat content in cheese.

Determination of fat in milk powders, M. SIEGFELD (*Molk. Ztg. [Hildesheim]*, 26 (1912), No. 50, pp. 933-935).—This is a comparative study of the hydrochloric acid method with and without the use of alcohol, the Gottlieb method, and the Gerber-Sieffeld (acid butyrometric) method. Some of these methods are employed for determining fat in cheese. The best and quickest results were obtained with the Gerber-Sieffeld method, but when quantities of fat as small as from 1.21 to 1.31 per cent were present in the sample no separation of the fat or plug formation took place. According to the author the determination of fat in these preparations is an uncertain quantity.

Examination and judgment of commercial feed stuffs, O. v. CZADEK (*Ztschr. Landw. Versuchsw. Österr.*, 15 (1912), No. 8, pp. 1020-1036).—In this article the methods adopted by the Association of Austrian Experiment Stations for sampling, chemical methods for estimation of water, crude, true, and digestible protein, crude fat (ether extract), nitrogen-free extractive substances, starch, pentosans, sugar (in molasses feeds), crude fiber, ash, and sand, and microscopical-bacteriological methods for detecting adulteration and decomposition are described, and conclusions to be drawn from the findings with the above methods as to bran, rice feed meal, millet polish meal, peanut bran and shells, barley bran, dried beet chips, brewers' grains, dried distillery and other slops, malt sprouts, oil cakes and oil-cake meals, meat and blood meals, molasses feeds, and artificial feeds are discussed in detail.

Examination and judgment of feed lime and calcium carbonate, O. v. CZADEK (*Ztschr. Landw. Versuchsw. Österr.*, 15 (1912), No. 8, pp. 1039-1041).—This is a statement in regard to the points to be considered when judging feed lime (precipitated calcium phosphate containing a large percentage of citrate-soluble phosphoric acid) and calcium carbonate. The methods considered in detail are for the determination of total and citrate-soluble phosphoric acid, while briefly mentioned are methods for water, arsenious acid, calcium chlorid,

sodium fluorid. and sulphurous acid, as adopted by the Association of Austrian Experiment Stations.

Examination and judgment of ethyl alcohol, B. HAAS (*Ztschr. Landw. Versuchsiv. Österr.*, 15 (1912), No. 8, pp. 1057-1067).—These methods, which were adopted by the Association of Austrian Experiment Stations, include organoleptic tests, quantitative tests for aldehyde, furfural, pyridin bases, and ammonia compounds, nitrous acid, denaturants (methyl alcohol, pyridin bases, acetic acid, sulphuric ether, turpentine, oil of lavender, oil of rosemary, castor oil, benzol, camphor, chloroform, iodoform, petroleum benzine, shellac, phenolphthalein, soap, stearic acid, animal oil, etc.), and metals. The quantitative methods are for ethyl alcohol, total solids, free acids, esters, aldehydes, furfural, and higher alcohol.

A new method for preparing alcohol-free fruit and grape wines, A. BÖHI (*Ein neues Verfahren zur Herstellung alkoholfreier Obst- und Traubenweine. Frauenfeld, 1912, pp. 71, figs. 11*).—A description of the carbonic acid method and its advantage over other methods.

Technology of sugar, G. DEJONGHE (*Technologie Sucrière. Lille, 1910, vol. 1, 2. ed., rev. and enl., pp. 420, figs. 368*).—This, the first volume of the work, deals with the technology of beet sugar manufacture.

Yearly report on sugar manufacture, R. TEYSSIER (*L'Année Sucrière. Paris, 1911, pp. 311, figs 34*).—This is a retrospect of the work done in 1909 and 1910 in regard to the cultivation of the various sugar-producing plants, the preparation of sugar therefrom, the utilization of the by-products, and innovations in the analytical methods.

The manufacture of chocolate, P. ZIPPERER (*Die Schokoladen-Fabrikation. Berlin, 1913, 3. ed., rev. and enl., pp. 349, pls. 3, figs. 128*).—This is the third edition of the monograph, which deals with the products which can be made from the fruit of the cacao tree. It treats especially of the preparation of chocolate, chocolate candies, dipped chocolates, and soluble cacao products. The machinery required for the above commodities is fully illustrated.

The fourth section of the book is devoted entirely to the examination and judgment of cacao products, and the various laws relating to the sale of these products in various countries.

Preservation of foods, N. P. ESCOBAR (*Estac. Agr. Expt. Ciudad Juárez, Chihuahua, Bol. 37, 1912, pp. 80, figs. 18*).—This is a discussion of the methods for preserving food products by drying, freezing, boiling, preventing the access of air, and antiseptics. The products considered are tomatoes, corn, peas, strawberries, apples, pears, plums, ham, pork sausage, and other meat products.

Casein: Its preparation and technical utilization, R. SCHERER, trans. by C. SALTER (*London and New York, 1911, 2. ed., rev. and enl., pp. XI+182, figs. 11*).—A second revised and enlarged English edition of this work (E. S. R., 17, p. 400).

The strength of textile plant fibers, L. H. DEWEY (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 128, pp. 17-21, figs. 2*).—More than 1,000 samples of cotton fibers have been tested with a machine which is based on the principle of balances with a sliding brass bar instead of weights. The machine is described in detail and is pictured in the original.

It has been found by numerous trials that the average breaking strain, measured in grams, of 20 fibers is approximately the same as that of a larger number. This is especially true of seed cotton where it is possible to take one of the fibers from each of 20 different seeds. "Furthermore, it is found that the fibers taken from midway on the side of the seed are more uniform than those at either end. Those at the pointed end are most variable."

The results of a large number of tests of samples are summarized below:

Tensile strength of cotton fibers.

Variety of cotton.	Breaking strain.		
	Highest.	Lowest.	Average.
American Upland (<i>Gossypium hirsutum</i>):	Grams.	Grams.	Grams.
Big-Boll Stormproof group.....	9.0	5.2	6.67
Big-Boll group.....	11.6	4.6	6.60
Cluster group.....	7.7	5.1	6.00
Semichuster group.....	7.1	4.7	5.86
Peterkin group.....	6.0	5.0	5.70
Early group.....	6.9	5.2	5.63
Long-staple group.....	5.6	3.5	4.72
Sea Island (<i>G. barbadense</i>).....	7.6	4.7	6.14
Egyptian (<i>G. barbadense</i>) from Arizona and California.....	8.0	5.6	6.65

"The highest and lowest figures given in the foregoing table are the averages for 20 fibers, not the highest and lowest breaking strain of single fibers. The tensile strength of single fibers of American Upland cotton is generally in inverse ratio to their length, though the longer staples make stronger yarns. The strength is in more direct ratio to the diameter.

"The accurate measurement of the diameters of the twisted, ribbonlike cotton fibers presents such difficulties and requires so much time that it is not included in all tests." The average diameter for American Upland, measured with an eyepiece micrometer, was 31.88 microns, maximum 34.8, and minimum 28.8; for Sea Island the average was 24.31, maximum 28.1, and minimum 21.75; and for American-grown Egyptian the average was 23.3, maximum 28.1, and minimum 18.4 microns. The pull necessary to detach the fiber from the seeds in American Upland varieties ranges from 1.83 to 2.3 gm., and in Sea Island from 1.75 to 1.95 gm.

Long-fiber material constitutes two natural groups: (1) Soft fibers such as bast fibers, which include flax, hemp, jute, and ramie; and (2) hard fibers, such as abacá (Manila hemp), henequen, sisal, and phormium (New Zealand hemp). The soft fibers vary greatly in thickness, and cling together so as to make it practically impossible to select strands for comparison.

For testing hard fibers, a machine having a capacity of 1 gm. to 90 kg. was used, and the breaking strain of each sample was computed to an arbitrary standard of a fiber weighing 1 gm. per meter of length.

Weight and breaking strain of hard fibers.

Kind of fiber.	Weight per meter.	Average breaking strain per strand.	Breaking strain per gram meter.
Abacá (Manila hemp), <i>Musa textilis</i> :	Grams.	Grams.	Grams.
Highest.....	0.04019	3,020	75,143
Lowest.....	.06817	2,012	29,521
Average.....	.05470	2,254	45,115
Henequen (Yucatan hemp), <i>Agave fourcroydes</i>.....	.05420	1,085	20,021
Sisal (Hawaii and East Africa), <i>A. sisalana</i>.....	.04370	1,472	32,773
Cantala (Manila maguey), <i>A. cantala</i>.....	.03040	625	2,055
Phormium (New Zealand hemp), <i>Phormium tenax</i>.....	.04670	1,222	26,159
Zapupe Vincent (<i>A. lespinassei</i>).....	.05120	1,394	27,198
Cabuya (from Costa Rica), <i>Purcarea cabuya</i>.....	.04070	1,297	31,933

"Several different grades of abacá are recognized in the market, the differences being due chiefly to greater or less care in cleaning the fiber, and therefore this fiber presents a wide variation in weight per meter and in strength. The highest and lowest figures given in the foregoing table do not represent the extreme limits. Henequen and sisal cleaned by machinery are more uniform."

METEOROLOGY—WATER.

The organization of a meteorological service for agriculture, P. BROOUNOFF (*Quelques Considérations sur l'Organisation du Service Météorologique dans les buts de l'Agriculture. St. Petersburg, 1912, pp. 12*).—This is a brief statement based largely upon considerations which controlled in the organization of the bureau of agricultural meteorology in Russia.

Notes on the meteorological bureau and the scientific committee of the agricultural ministry of Russia, P. BROOUNOFF (*Quelques Données sur le Bureau Météorologique du Comité Scientifique du Ministère de l'Agriculture. [St. Petersburg, 1912], pp. 7*).—This pamphlet gives a brief history of the organization and development of the bureau of agricultural meteorology of Russia.

Meteorological observations by the Hamburg observatory in Bergedorf, 1910 and 1911, R. SCHÖRR (*Jahrb. Hamburg. Wiss. Anst., 29 (1911), Beiheft 5, pp. X+93, pls. 3*).—Tabular summaries are given of observations during the period named on pressure, air and soil temperature, humidity, precipitation, wind movement, and sunshine.

Bulletin of the Mount Weather Observatory (U. S. Dept. Agr., *Bul. Mount Weather Observ., 5 (1913), pt. 5, pp. 295-364, pl. 1, figs. 11*).—This number contains the following articles: The Effect of the Atmospheric Turbidity of 1912 on Solar Radiation Intensities and Skylight Polarization (illus.), by H. H. Kimball; The Haze of the Upper Atmosphere, by R. O. E. Davis; Dynamic Meteorology, by H. Bateman; and Elementary Problems in Meteorology, Second Series (illus.), by C. F. von Herrmann.

Relation of meteorological study to more logical systems of cropping and to crop production, J. F. VOORHEES (*Proc. Soc. Prom. Agr. Sci., 33 (1912), pp. 87-101, figs. 8*).—This article points out how more intensive and efficient systems of farming may be secured by adapting them more perfectly to the climatic conditions. A plea is also made for wide cooperation in the systematic study of this problem.

Agricultural crops and the weather, P. BROOUNOFF (*Les Cultures Agricoles et le Temps. St. Petersburg, 1912, pp. 44, figs. 23*).—This pamphlet discusses the adaptation of cropping systems to climatic conditions. It describes the character and distribution of agricultural meteorological stations in Russia and summarizes some of the more important results of the investigations carried on by these stations, especially with reference to the climatic adaptation of various crops.

The influence of the moon on the weather, G. WAGNER (*Gerlands Beitr. Geophysik, 12 (1913), No. 2, pp. 277-328*).—This is a review of the history and present status of popular belief and scientific opinion regarding the relation of the moon to the weather.

Snow surveys for predicting stream flows, J. C. ALTER (*Engin. News, 69 (1913), No. 22, pp. 1110-1113, figs. 10; Irrig. Age, 28 (1913), No. 7, pp. 210, 211, figs. 4*).—This article describes the instruments and methods used and results obtained in the surveys made by the U. S. Weather Bureau of snowfall in the Wasatch Mountains near Springville, Utah, for the purpose of securing a basis for predicting the summer flow of Maple Creek. See also a previous

note (E. S. R., 27, p. 510). The practical value of such surveys for towns, farming communities, and irrigation companies is discussed.

The underground water supply of west-central and west Florida, E. H. SELLARDS and H. GUNTER (*Fla. Geol. Survey Ann. Rpt.*, 4 (1911), pp. 81-160, pls. 4, figs. 12).—In this paper, which is the third of a series (E. S. R., 25, p. 18), the artesian water supply is discussed in detail for each county lying in an area bordering the Gulf of Mexico from the Perdido to the Suwanee River, and varying in width from 40 to 100 miles.

Studies of fish life and water pollution, H. W. CLARK and G. O. ADAMS (*Orig. Commun. S. Internat. Cong. Appl. Chem.* [Washington and New York], 26 (1912), Sect. VIIA, pp. 199-210).—The effect of sewage of different degrees of concentration, of aeration, of nitrates, iron, potassium, carbonates, etc., and of green growths in the sewage on the life and health of fish was studied in the experiments here reported.

Some tests as to the efficacy of chlorinated lime in purifying drinking water, A. T. COOPER (*Military Surg.*, 30 (1912), No. 5, pp. 574-577).—Raw river water and tap water, containing in some instances *Bacillus coli* and in others *B. typhosus*, were treated with chlorid of lime in various dilutions and the reduction in bacterial content determined after treatment for from 10 to 20 minutes.

The results obtained showed that 1 part of chlorid of lime, containing 30 per cent available chlorine, in 200,000 parts of the water to be treated, caused a reduction of the bacteria to not over 10 per cubic centimeter, and in most cases completely sterilized the water after 20 minutes' treatment. Clear water treated in this manner could be used for drinking with safety.

SOILS—FERTILIZERS.

The formation, properties, and characteristics of agricultural soils, J. P. FACIO (*Agricultura General. I. Estudio Sobre la Formación, Propiedades y Caracteres del Suelo Agrícola. Mendoza, Argentina, 1912*, pp. 107).—This is a general treatise on the subject.

Analysis of Everglade soils, R. E. ROSE (*Fla. Quart. Bul. Dept. Agr.*, 23 (1913), No. 1, pp. 140-148, pl. 1).—The average of 34 samples of these soils showed ammonia 3.1 per cent, phosphoric acid 0.18 per cent, and potash 0.08 per cent.

The causes of the fertility of the western Australian semiarid wheat lands, G. A. PRISTER (*Jour. Nat. Hist. and Sci. Soc. West. Aust.*, 4 (1912), pp. 38-46).—The fertility of these lands and their failure to respond to nitrate fertilizer are attributed to conditions favoring rapid and long continued nitrification with little leaching of the nitrates from the soil.

Recent investigations on absorption by cultivated soil, A. MAYER (*Fühl-ing's Landw. Ztg.*, 62 (1913), No. 7, pp. 225-231).—This is a brief critical review of recent investigations on this subject.

The plant food of soils under the influence of bacteria, A. KOCH (*Chem. Ztg.*, 36 (1912), No. 77, p. 726; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 37 (1913), No. 4-6, p. 103).—Attention is called in this article to the danger of loss of nitrates from the soil when wet weather succeeds a long period of active nitrification, and also to the relation of the organic matter in the soil to the activity of organisms which reduce nitrates and fix nitrogen in less available organic forms. The action of the carbon dioxide produced by bacterial respiration in rendering potash and phosphoric acid of the soils soluble and the "biological" absorption of phosphoric acid and potash by bacteria are also referred to.

Decomposition of silicates by soil bacteria, I. K. BASSALIK (*Ztschr. Gärungsphysiol.*, 2 (1912), No. 1, pp. 1-32; abs. in *Centbl. Bakt. [etc.]*, 2. Abt., 37 (1913), No. 4-6, p. 104).—An account is here given of investigations on the relation of angleworms to the activity of soil bacteria and on the decomposition of orthoclase by soil bacteria.

It was found that the same bacterial flora occurred in the alimentary canal and excrement of angleworms as in the soil from which they were taken, but that the bacteria were much more active in the former case in the decomposition processes in the soil. The worms acted not only directly in decomposing mineral substances in the soil, but also indirectly by grinding and polishing the soil particles so that the kaolin coating was removed and fresh surfaces presented for the decomposing processes. Bacteria were found to be capable of corroding polished marble and of penetrating between the lamellæ of mica. They were also capable of utilizing the feldspar as a source of mineral plant food and of bringing into solution appreciable amounts of powdered unweathered orthoclase largely by means of the carbon dioxide which they produce. Especially active in this respect on account of its great energy of respiration was a new species for which the name *Bacillus extorquens* is proposed.

The action of cold on micro-organisms and their activity in the soil, G. G. A. WEBER (*Die Einwirkung der Kälte auf die Mikro-organismen und ihre Tätigkeit im Boden. Inaug. Diss., Univ. Jena, 1912, pp. 88; rev. in Centbl. Bakt. [etc.]*, 2. Abt., 37 (1913), No. 4-6, p. 113).—Seven soils of different properties were subjected to temperatures of from -10 to -20° C. for 14-day periods and the effect upon the number of micro-organisms, as well as upon nitrification and denitrification, was observed. The bacterial count was greatly increased by the treatment, denitrification was slightly decreased, and the effect on nitrification was variable.

Tests of a bacteria-inoculating preparation, G. BREDEMANN (*Landw. Jahrb.*, 43 (1913), No. 5, pp. 669-694).—Tests of an American proprietary article for increasing the nitrogen assimilation by leguminous plants are reported.

A note on the protozoa from sick soils with some account of the life cycle of a flagellate monad, C. H. MARTIN (*Proc. Roy. Soc. [London]*, Ser. B, 85 (1912), No. B 580, pp. 393-400, pl. 1; abs. in *Centbl. Bakt. [etc.]*, 2. Abt. 37 (1913), No. 4-6, p. 105).—A large number of protozoa isolated from sewage-sick soils by means of agar plate cultures are described, especial attention being given to a flagellate monad which appeared to be identical with *Cercomonas termo*.

The chemistry of the soil nitrogen, S. L. JODIDI (*Jour. Franklin Inst.*, 175 (1913), No. 5, pp. 483-495).—This article is based largely upon investigations by the author noted elsewhere (*E. S. R.*, 26, p. 615; 29, p. 124), but also reviews and gives a bibliography of the literature of other investigations on the subject. It is shown that the proteins and nucleoproteids constitute the greater part of the nitrogen compounds of the soil; that, while amino acids and acid amides do not accumulate to any considerable extent in the soil, they are important transition stages between the proteins and nucleoproteids and ammonia; that ammonia and nitrites do not accumulate to any extent in the soil but are valuable transition products in the formation of nitrates; and that nitrates, representing the final stage in the transformation of nitrogenous compounds in the soil, can under certain conditions accumulate in the soil, but ordinarily are rapidly taken up by plants or leached out in the drainage.

Importance of the error of analysis in the solution of the question of the nitrogen economy of cultivated soils, T. PFEIFFER and E. BLANCK (*Landw.*

Vers. Stat., 78 (1912), No. 5-6, pp. 367-374; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 604, I, p. 238).—In an effort to obtain a satisfactory nitrogen balance in the experimental soils at Breslau 5 samples of soil were taken on each of 6 plats, 9 square meters each, which had given similar yields of crops during two years. Ten or 12 nitrogen determinations were made in each sample. An experimental error corresponding to from 25 to over 30 kg. of nitrogen per hectare to a depth of 25 cm. occurred with this method of examination.

The influence of alfalfa and of timothy on production of nitrates in soils, T. L. LYON and J. A. BIZZELL (*Centbl. Bakt. [etc.]*, 2. Abt., 37 (1913), No. 7-10, pp. 161-167).—The rate of nitrification in fallow soils and those which had been continuously in alfalfa and timothy for several years was studied by means of incubation experiments with dried blood with and without the addition of lime.

The results "showed the alfalfa soil to nitrify more rapidly than the timothy soil, both in the soil on which the crops had been grown continuously and in that from which they had been removed and the soil kept bare for two seasons. That this was due to the direct effects of the plant on the nitrate production and not to the greater quantity of nitrogen which the plants stored in the soil is shown by the fact that the rate of nitrate formation was in the order named when both soils contained approximately equal quantities of dried blood."

Summer temperatures of the soil in relation to the supply of available nitrogen in the wheat areas, W. C. GRASBY (*West Australian*, 1911, Feb. 17; *abs. in Jour. Nat. Hist. and Sci. Soc. West. Aust.*, 4 (1912), pp. 9-11).—The relation of soil temperatures during hot weather (as high as 150° F. in certain cases reported) to Russell and Hutchinson's theory of partial sterilization of the soil as a means of promoting ammonification is briefly discussed.

The effect of ignition on solubility of soil phosphates, C. B. LIPMAN (*Jour. Indus. and Engin. Chem.*, 4 (1912), No. 9, pp. 663, 664).—It was found that ignition decreased the solubility of the phosphoric acid of soils when digested with concentrated nitric acid for two days on the steam bath.

The effect of ignition on the solubility of soil phosphates, G. S. FRAPS (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 5, p. 416).—Replying to the article by C. B. Lipman noted above, the author reiterates his conclusion that ignition renders the phosphoric acid of the soil more soluble in cold hydrochloric acid.

Fertilization of citrus soils, A. SMITH and H. E. BILLINGS (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 5, pp. 415, 416).—Examinations of the irrigation waters used on some of these soils showed the presence of sufficient amounts of potash, in the opinion of the author, to render application of potash salts unnecessary.

The influence of stable manure upon the fertility of the soil, W. L. OWEN (*Amer. Sugar Indus.*, 15 (1913), No. 5, pp. 27-29).—This article shows how manure improves the physical, chemical, and bacteriological conditions of the soil, emphasizing particularly the benefits that would result from the application of manure on the cane soils of Louisiana in furnishing the soils with those bacteria which quickly decompose vegetable matter and prevent its being used by bacteria which cause loss of soil nitrogen. It is shown that the organic matter of leguminous plants is more effective in this respect than that of other kinds of plants.

The conservation of phosphates in the urine, P. E. BROWNING (*8. Internat. Cong. Appl. Chem. [Washington and New York] Orig. Commun.*, 15 (1912), Sect. VII, p. 41; *Discussions*, 27 (1912), pp. 122, 123).—A method of precipitat-

ing phosphates from urine by means of calcium hydroxid is briefly described, and it is suggested that this may furnish a means of preventing a large waste of phosphate.

The original chemical composition of Peruvian guano (*Riqueza Agr. [Lima, Peru], 1 (1912), No. 10, pp. 643-640, figs. 6; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 2, pp. 194-196*).—This article shows the variation in composition of Peruvian guano as dependent upon (1) the species of birds producing it, (2) the geographical situation of the deposits, especially with reference to rainfall, (3) the period of formation, (4) the depth of strata used, and (5) the feather content.

The composition of the guano varies widely with the species of bird producing it. The greater the rainfall the lower the nitrogen content and the higher the phosphoric acid content of the guano. The older the guano the poorer it is in nitrogen. The nearer the deposits are to the surface of the ground the smaller the amount of organic matter. The nitrogen content increases with the content of feathers, but a large admixture of feathers is undesirable for various reasons.

Some analyses of fish scrap, J. R. LINDEMUTH and E. G. PARKER (*Jour. Indus. and Engin. Chem., 5 (1913), No. 5, pp. 388, 389*).—Methods and results of analyses of 11 samples of fish scrap are reported.

The menhaden industry, J. W. TURRENTINE (*Jour. Indus. and Engin. Chem., 5 (1913), No. 5, pp. 378-388*).—The history and present status of methods used and the output, quality, and value of oil and fish scrap (fertilizer and feed) produced are discussed.

Nitrate shales, W. DUNSTAN (*Agr. Jour. Egypt, 2 (1913), No. 2, pp. 89-91*).—Analyses of shales from the Kena district of Upper Egypt, showing from 4.85 to 15.43 per cent of sodium nitrate, are reported, also results of attempts to extract the nitrate from the shales by fractional percolation with limited amounts of water. It was found to be possible to obtain a saline product containing about 50 per cent of sodium nitrate combined with about 38 per cent of sodium chlorid and 10 per cent of sodium sulphate.

On the influence of calcium nitrate and ammonium sulphate on the assimilation of phosphoric acid of raw phosphates, N. NEDOKUCHAEV (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 14 (1913), No. 1, pp. 1-21*).—Pot and field experiments with oats, flax, and potatoes were carried out from 1909 to 1911 to determine the influence of calcium nitrate and ammonium sulphate on the assimilation of phosphoric acid of phosphorite. In the pot experiments quartz sand and loam soil were used. The field experiments were made only on loam soil.

The yield was in all cases increased where ammonium sulphate was used, due in the author's opinion to the influence of the sulphate in rendering the phosphoric acid more soluble. The yield was reduced where calcium nitrate was used, due to the fact that the lime of the nitrate reduced the assimilability of the phosphoric acid.

The production of ammonium sulphate in 1912 (*Jour. Indus. and Engin. Chem., 5 (1913), No. 3, p. 253; abs. in Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 101, p. 575*).—It is stated that the world's output of ammonium sulphate during 1912 was as follows: Germany, 465,000 tons; United Kingdom, 379,000 tons; United States, 155,000 tons; France, 68,500 tons; Belgium, 49,500 tons; other countries, 170,000 tons, making a total of 1,287,000 tons.

"Most of the ammonium sulphate is obtained as a by-product in gas works, and is derived by neutralizing the ammoniacal liquor by sulphuric acid and then crystallizing out the sulphate. Germany's lead in the production is due to her increasing use of by-product coke ovens and producer gas plants. The

consumption of ammonium sulphate in the United States last year is stated to be 215,000 tons."

Aluminum nitrid and the nitrogen problem, O. SERPEK (*Österr. Chem. Ztg.*, 16 (1913), No. 8, pp. 104-109, figs. 5).—The Serpek process and its industrial possibilities are discussed.

Some preliminary experiments on the use of sodium bisulphate in the preparation of double superphosphate, F. T. PERITURIN (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscow)*, 19 (1913), No. 1, pp. 142-151).—The author studied the equilibrium of sodium bisulphate and orthophosphoric acid in solution and the behavior on evaporation of the solution in relation to the preparation of double superphosphates.

Experiments with phosphatic fertilizers in Uruguay, J. SCHRODER (*Rev. Asoc. Rural Uruguay*, 42 (1913), No. 2, pp. 94-98).—The results of comparative tests of bone meal, superphosphate, and Thomas slag are reported with analyses of the soil used in the experiments.

European imports of phosphate, L. MEMMINGER, A. GAULIN, and R. P. SKINNER (*Daily Cons. and Trade Rpts. [U. S.]*, 16 (1913), No. 67, pp. 1427-1429).—It is stated that the French imports of phosphates in 1912 amounted to 903,489 metric tons, of which over 700,000 tons came from Tunis. The total German imports of phosphates in that year amounted to 902,844 tons, of which 342,646 tons came from the United States and over 300,000 tons came from Algeria and Tunis.

Field experiments to determine the effect of the potash of phonolite, L. HILTNER and F. LANG (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser.*, 11 (1913), Nos. 2, pp. 13-16; 3, pp. 38-41).—In experiments with different crops, using phonolite and kainit in connection with green manure, the potash of the phonolite was on the average about 36 per cent as effective as that of kainit. The author believes that further experiments are needed to determine the exact practical value of phonolite.

The use of Bohemian phonolite for fertilizing purposes, F. SEEMANN (*Landw. Jahrb.*, 43 (1913), No. 4, pp. 509-520; *abs. in Ztschr. Angew. Chem.*, 26 (1913), No. 24, *Referatenteil*, p. 195).—Phonolite containing from 4 to 6 per cent of potash, of which not more than 2 per cent was soluble, was found to be much inferior in fertilizing effect to leucite containing from 9 to 10 per cent of potash, of which 3½ per cent was soluble. The solubility of the potash of the phonolite was increased by the addition of lime salts, and humus, but to a less extent than in case of the leucite.

Origin and formation of the German potash deposits, H. E. BÖCKE (*Umschau*, 17 (1913), No. 11, pp. 207-210, figs. 3).—The various theories which have been advanced as to the origin and formation of the German potash deposits are critically discussed in this article.

Prospecting for potash (*Amer. Fert.*, 38 (1913), No. 9, pp. 44, 45).—This is a preliminary account of investigations by the U. S. Geological Survey in Death Valley, California, which did not indicate the occurrence of any extensive segregated deposits of potash salts.

Sulphur as a fertilizer, TRITSCHLER (*Deut. Landw. Presse*, 40 (1913), No. 33, p. 405).—In experiments with mangel-wurzels the use of sulphur slightly increased the yield and sugar content, but this is attributed not so much to the fertilizing effect of the sulphur as to its protection of the crop from insects and disease.

Utilization of the waste from the manufacture of trinitrotoluene, V. P. KOCHETKOV (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscow)*, 19 (1913), No. 1, pp. 56-59).—This waste, which contained from 62 to 72 per cent of sulphuric acid and 2 to 3 per cent of nitric acid, was used in the preparation

of superphosphate from a Russian rock phosphate. Somewhat better results were obtained with the waste than with ordinary sulphuric acid, the superphosphate obtained being drier and more pulverulent than ordinary superphosphate.

Value of fertilizing constituents of weeds of Indiana: Analysis of ironweeds, F. MATHERS and GAIL M. STAPP (*Proc. Ind. Acad. Sci.*, 1911, pp. 341, 342).—Two analyses of ironweeds are reported showing 1.28 and 1.29 per cent of nitrogen, 0.63 and 0.66 per cent of phosphoric acid, and 0.98 and 0.95 per cent of potash.

Fertilizers, R. E. ROSE and L. HELMBURGER (*Fla. Quart. Bul. Agr. Dept.*, 23 (1913), No. 2, pp. 93-104, 108-114).—An account is given of the fertilizer inspection during 1913, including analyses of fertilizers examined, with notes on laws and regulations and valuation of fertilizers.

Analyses of fertilizers, fall season, 1912, B. W. KILGORE ET AL. (*Bul. N. C. Dept. Agr.*, 34 (1913), No. 1, pp. 96).—This bulletin contains analyses of fertilizers collected by the fertilizer inspectors of the state department of agriculture during the fall of 1912, as well as a list of brands of fertilizers registered for sale during the fall season.

AGRICULTURAL BOTANY.

Form and structure of certain plant hybrids in comparison with the form and structure of their parents, H. B. BROWN (*Mississippi Sta. Tech. Bul.* 3, pp. 54, figs. 53).—An investigation is reported on the inheritance of histological characters as shown by microscopical studies of certain hybrids. The hybrids were obtained by crossing three species of *Nicotiana* and the genera *Raphanus* and *Brassica*.

The majority of the characters of the hybrids studied were intermediate between the corresponding characters of the parents. *N. tabacum*, when used as a pistillate parent in a cross with *N. sylvestris*, influenced the external or morphological characters of the hybrid to the extent of 64.6 per cent, and the histological characters 61.9 per cent. When used as a pistillate parent, *N. tabacum* crossed with *N. alata* influenced the external characters of the hybrid to the extent of 36.5 per cent, and the histological characters 37.2 per cent. When *R. sativus* was used as a pistillate parent in a cross with *B. oleracea caulorapa*, it had influence over the external characters of the hybrid to the extent of 62.2, and the histological characters 54.7 per cent.

The author states that there is a close relation between the external and histological characters. In every hybrid studied the parent having the higher percentage of dominance in one set of characters was also dominant in the other set by about the same percentage. Neither parent in the crosses studied exercised a uniform influence over any particular characters of the hybrid or over the sum total of all characters.

A bibliography of the subject is appended.

On the partial sterility of *Nicotiana* hybrids made with *N. sylvestris* as a parent, T. H. GOODSPEED (*Univ. Cal. Pubs., Bot.*, 5 (1913), No. 4, pp. 189-198).—In continuation of studies in *Nicotiana* (*E. S. R.*, 23, p. 530), the author gives the results of a study of F_1 hybrids produced between *N. sylvestris* and *N. tabacum macrophylla purpurea*, particular attention being given to the phenomenon of sterility in hybrid plants grown from the hybrid seed resulting from the 1911 crosses.

It is said that one of the noticeable traits of these plants was the readiness with which the flowers fall immediately after anthesis, due to the formation of an absciss layer, which cuts off all possibility of the transfer of food materials

to the maturing ovules. In some of the plants, however, capsules were formed, and an examination made of 650 showed seed in a small proportion of them. One hundred capsules were found to contain nearly 900 seed, 26 per cent of which germinated. This seems to indicate that the F_1 hybrids resulting from the crossing of *N. sylvestris* and *N. tabacum* should be included among those hybrids which are only partially self-sterile.

The bearing of teratological development in *Nicotiana* on theories of heredity, O. E. WHITE (*Amer. Nat.*, 47 (1913), No. 556, pp. 206-228, figs. 2).—A preliminary report is given of a study of the abnormal development of *Nicotiana* considered from the standpoint of pedigree culture and cytological methods. Two strains of *N. tabacum* were investigated, one of which was a sport from the other. The sport is shown to differ from the normal form in the possession of a unit character due to one Mendelian factor. When it is crossed with the normal form there results in F_2 a simple Mendelian ratio of 3:1.

The author concludes that the facts obtained by his investigations warrant the belief that some agent is at work on the internal structure as well as on the so-called external that is of such a nature as to produce abnormalities in cell structure as well as in cell complexes or plant organs. This raises a question as to the significance of chromosomes in inheritance. From a study of chromosomes in relation to Mendelian factors and as a basis of inheritance, he concludes that while the phenomena of segregation may be capable of interpretation on a morphological basis, the gene for fasciation appears to lie deeper in sporogenesis than chromosomes. The abnormal character development, it is believed, is most easily interpreted from a physiological standpoint.

Tetraploid mutants and chromosome mechanisms, R. R. GATES (*Biol. Centbl.*, 33 (1913), No. 3, pp. 113-150, figs. 7).—The author reports a study of gigantism and tetraploidy in *Oenothera* from a comparative standpoint made with a view to securing a better understanding of their relation to evolution. In addition to the gigas type described by de Vries, studies were made of other giant forms that have arisen independently in Italy and Sweden. Statistical studies were made of the pollen grains, and the chromosomes of the different races were compared.

The author concludes that some of the characters of *Oenothera* are Mendelian in their behavior after they have arisen, but that such combinations are not always adequate to account for their original appearance. He agrees with Nilsson that many of the mutant differences are due to changes which are fundamentally quantitative. Many of the size differences in the races with higher chromosome numbers are also probably due to differences in the number of chromosomes in their cells.

A bibliography of the subject is given.

Herbage studies.—II, Variation in *Lotus corniculatus* and *Trifolium repens* (cyanophoric plants), H. E. and E. F. ARMSTRONG and E. HORTON (*Proc. Roy. Soc. [London]*, Ser. B, 86 (1913), No. B 587, pp. 262-269).—In continuation of work previously noted (E. S. R., 27, p. 30), the authors extended their studies of *L. corniculatus*. As a result it is claimed that while the normal form of this plant met with in southern parts of Great Britain contains both a cyanophoric glucosid and the correlated enzymes, in Scotland and also in Norway a form prevails which is rich in enzym but contains mere traces of the glucosid, and that a third form of this clover exists in which the amount of enzym is also very small. It is thought that to these two correlated factors, glucosid and enzym, a third is to be added, probably one influencing concentration. The suggestion is made that by continuing work in this direction some light may be obtained on the general problem of variation.

Experiments with white clover raised from cultivated seed showed no cyanid, while tests showed its presence in sprouting wild seed as soon as the cotyledons began to assume a green tinge, the response increasing rapidly thereafter. It is thought that these differences are similar to those observed in *L. corniculatus* and the question is raised whether or not these variations are correlated with others affecting the useful qualities of these plants.

Is salinity a factor in the distribution of *Nereocystis luetkeana*? G. B. RIGG (*Bul. Torrey Bot. Club*, 40 (1913), No. 5, pp. 237-242, fig. 1).—In connection with work of the Bureau of Soils of this Department, the author has investigated the kelp beds of Puget Sound as a possible source of potash fertilizer. A bed of the bladder kelp (*N. luetkeana*) in Freshwater Bay near the mouth of the Elwha River, Washington, was studied to determine the effect of fresh water on the distribution of the kelp. On the basis of his investigations at this point, he reaches the conclusion, also confirmed by conversations and correspondence with others, that kelps are to be looked for only where the water has practically the normal salinity of sea water.

The effect of lime upon the alkali tolerance of wheat seedlings, J. A. LECLERC and J. F. BEEZEALE (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 26 (1912), Sect. VIa-XIb, App., p. 135).—An abstract is given of a paper presented by the authors describing experiments conducted with wheat seedlings in culture media, sand, and clay to determine the effect of lime on the absorption of sodium chlorid by the plants.

In the culture solution it was found that the tolerance of the wheat seedling for sodium chlorid was about 0.30 per cent. In the sand the seedlings were slightly more resistant, but in the clay marked tolerance was shown by the seedlings toward sodium chlorid. This was found to be due to the lime which the clay contained. Analysis of the seedlings grown in 0.40 per cent sodium chlorid with and without the addition of calcium salt showed as much sodium chlorid absorbed by the seedlings grown in the presence of lime as in those grown in the sodium chlorid solution only.

It is claimed that the benefit which lime exerts is not one of preventing the absorption of the toxic sodium chlorid by the plant, but rather one in which the toxicity is overcome by the presence of lime. A similar tendency was shown by lime in overcoming the toxicity of sodium sulphate.

Antitoxic effects of calcium on some salts in nutritive solutions for peas and lupines, MILE. C. ROBERT (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 11, pp. 915-918).—Peas sprouted in distilled water and then transferred to a medium containing 0.025 per cent of magnesium sulphate, 0.05 per cent of hydrogen potassium phosphate, and 0.05 per cent ammonium nitrate showed arrest of development. This, however, was overcome on the addition of 0.05 per cent calcium carbonate or calcium sulphate, the growth then continuing to the point of practical exhaustion of some component. Grown in the calcium sulphate solution alone, the peas showed a remarkable increase of length and weight over those grown in water, while the other salts each gave much less growth than was noted in water alone. All cultures with calcium sulphate showed almost or quite as much increase as was obtained with the latter salt alone. The differences were accentuated with white lupines, which proved more sensitive to toxicity than did peas; but wheat and corn, which do not appear to be unfavorably affected by potassium, gave less definite results. Further investigations with these two cereals are contemplated. It is thought that the calcium salt neutralizes a toxicity exerted by the other salts at the concentration here employed.

Starch content as related to geotropism of roots of *Lepidium sativum* and other plants cultivated in alum solutions, A. BLOCK (*Bot. Centbl., Beihefte*,

28 (1912), 1. Abt., No. 3, pp. 422-452, figs. 6).—As a result of studies carried out with cultures of *L. sativum*, *Helianthus annuus*, *Vicia faba*, *Trifolium repens*, and *Setaria italica* in alum solutions, the author states that roots lacking starch showed no geotropic response even when capable of growth, and that in several cases the degree of geotropism was observed to show increase corresponding to the increase in starch content.

Symbiosis of plants as a chemical problem, J. ZELLNER (*Bot. Centbl., Beihefte*, 28 (1912), 1. Abt., No. 3, pp. 473-486; *abs. in Bot. Centbl.*, 122 (1913), No. 11, pp. 229, 239).—The author reports on a study of the relations between plants associated in various degrees as symbionts or as host and parasite in regard to their chemical likenesses and differences, their absorption, excretion, and exchange of dissolved substances, and the transformations that take place in each. A considerable number of details, qualitative and quantitative, are given in regard to lichens, smut and grain, mistletoe and its hosts, etc. It would seem that the chemical composition, reactions, etc., of symbiont or parasite are determined by its systematic position rather than by the chemical characters of its associate or host.

The influence of manganese on the formation of chlorophyll, EVA MAMELI (*Atti Soc. Ital. Prog. Sci. [Rome]*, 5 (1911), pp. 793-799; *abs. in Bot. Centbl.*, 122 (1913), No. 10, p. 200).—It is stated that several plants (*Protococcus viridis*, *Spirogyra majuscula*, *Vaucheria* sp., *Zea mays*, *Polygonum fagopyrum*, *Helianthus annuus*, and *Torenia fournieri*) in a nutritive medium lacking manganese remain colorless, or very pale, but that addition of manganese in increasing proportion leads to a correspondingly increasing show of green color. The author notes the agreement of this finding with the results of Willstätter's investigations (*E. S. R.*, 24, pp. 329, 628).

On the state of chlorophyll in plants and colloidal chlorophyll, A. HERLITZKA (*Arch. Ital. Biol.*, 58 (1912), No. 3, pp. 388-392).—The author submits the results of experiments and spectroscopic examinations of colloidal solutions of chlorophyll, of solutions of alcohol and acetone, and of the expressed juice of leaves.

It is stated that the colloidal solutions showed spectra and behavior in general similar to those observed in case of living leaves and expressed juices, and unlike those from alcoholic solutions. These results are held to agree with those previously announced (*E. S. R.*, 27, p. 227), and to show that in living leaves chlorophyll exists in a colloidal state.

The distribution of ions within the plant body in relation particularly to the localization of protein formation, C. ACQUA (*Ann. Bot. [Rome]*, 11 (1913), No. 2, pp. 281-312, pls. 3).—Continuing work previously noted (*E. S. R.*, 24, p. 531), the author studied the effects produced upon wheat, corn, beans, peas, and white mustard when grown in solutions, more or less concentrated, of manganese nitrate and other salts which indicate the presence of the separated ions by tissue coloration.

The results, while varying in details, showed agreement as to the main facts observed. The cations were found mainly in the roots (particularly in the meristems of the secondary roots), but occasionally in the aerial portions, in this case in close relation to the protein storage cells, as in the case of the bean plant. It is thought that these circumstances reveal the regions in which occurs the utilization of nitrates, sulphates, etc., with synthesis of proteins, such regions always being those of newly formed or actively dividing cells.

In some cases it was noted that the endodermis limited the movement or localization of the cations. This layer is thought to exhibit here the char-

acter of a special semipermeable membrane, according to the conception of J. de Rufz de Lavison (E. S. R., 25, pp. 730, 731).

Respiration of plants as hydrolytic oxidation, W. PALLADIN (*Ber. Deut. Bot. Gesell.*, 31 (1913), No. 2, pp. 80-82).—Continuing work previously noted (E. S. R., 27, p. 632), the author makes the following statements:

Alkaline solutions containing chromogens eagerly absorb atmospheric oxygen, at the same time forming brownish red pigments. During alcoholic fermentation compounds are formed which readily give up to the respiratory pigments their hydrogen, which is oxidized by the absorbed oxygen, the result being a pigment and water. Hydrogen is said to be separated in considerable quantity in an alkaline solution of formaldehyde in the presence of copper monoxid, formic acid being produced therein as the result.

Absorption of oxygen by the respiratory chromogens of plants, W. PALLADIN and Z. TOLSTAJA (*Biochem. Ztschr.*, 49 (1913), No. 5, pp. 381-397, figs. 2).—In connection with the work noted above, the authors report the conclusions resulting from another series of investigations substantially as follows:

Respiratory chromogens may be extracted from plants by means of methyl alcohol. Alkaline solutions of these chromogens absorb oxygen from the air, forming brownish red pigments. The protoplasm in which such absorption occurs possesses an alkaline reaction. These chromogens may also be oxidized by means of peroxidase and by hydrogen peroxid. Aqueous extracts of plants also contain chromogens which, after addition of alkali, absorb atmospheric oxygen, but this capability is diminished or suspended on boiling.

Chromogens extracted with wood alcohol are scarcely at all oxidized by atmospheric air, but such chromogens from plants subjected for several days to autolysis in an acid-free medium absorb oxygen energetically from air with the formation of pigments. Such altered chromogens are called reduced, as distinguished from ordinary chromogens, which by autolysis with yeast may be changed to the reduced form. Plants which yield on autolysis in an acid-free medium a chromogen quickly turning dark in air yield no trace whatever of pigment under like treatment in a medium containing acid.

During alcoholic fermentation (and therefore during the first anaerobic stage of respiration) products are formed which readily give up their hydrogen to the respiratory pigments by which the hydrogen is oxidized to water. Boiling does not prevent such products from giving up their hydrogen to the chromogen. The respiratory chromogens resemble the leucoplasts in giving up their hydrogen to the absorbed oxygen, the result being pigment and water. The oxygen absorbed during respiration is utilized after removal of the hydrogen from the plant.

Periodical daily fluctuations of respiration in foliage leaves in darkness and their probable relation to carbon dioxid assimilation, II, A. MEYER and N. T. DELEANO (*Ztschr. Bot.*, 5 (1913), No. 4, pp. 209-320, figs. 36).—As the result of a long series of investigations with attached leaves of beet in continuance of the work done with separated leaves previously noted (E. S. R., 26, p. 822), the authors state that no direct effect or certain afterinfluence of light upon the production of carbon dioxid could be established.

The variations observed are thought to be related to assimilation changes resulting from illumination, these consisting partly in a sudden increase in carbohydrate content of the cells, which is said to correspond to increased capacity for respiration. Such variations did not occur in well grown etiolated leaves. The periodicity of the leaves is pointed to as evidence of a somewhat mechanical character of the cells, certain factors, such as changes in assimilation, transportation, etc., acting as excitants to such machinery of stimulation. Further investigations are contemplated. A bibliography is appended.

Some bacteriological studies of old soils, L. T. SHARP (*Plant World*, 16 (1913), No. 4, pp. 101-115).—The author describes a bacteriological examination of soil samples that had been kept tightly stoppered for from 25 to 33 years in the soil laboratory of the University of California. The investigation included not only a study of the number of organisms present, but also their physiological characteristics as shown by their ammonification, nitrification, and nitrogen fixation powers. The soil samples represented a variety of types, from heavy adobe to light red sandy soils, together with samples containing varying quantities of alkali, so that the diversity in the samples, it is believed, permits of a wide application of the facts obtained.

It was found that soils free from excessive alkali salts retained from 75,000 to 570,000 organisms per gram after 30 years drying under room conditions. Alkali soils under similar conditions contained from 5,000 to 60,000 organisms per gram. The ammonification flora were found most resistant to drying, being especially strong in the alkali soils. The nitrification occurred feebly in 2 soils but was permanently destroyed in 7 others. *Azotobacter* was entirely absent in all but one sample, though the nitrogen fixation power of the soils was well maintained by other organisms. There seemed to be no relation between the numbers and physiological efficiency of the organisms present. It is believed that the persistency of these organisms under dry conditions and their renewed activity in the presence of sufficient moisture is agriculturally important. Soil is believed to exhibit a protective function toward the lower forms of plant life under adverse conditions.

The activity of bacteria in forest soils, W. MIGULA (*Forstw. Centbl.*, n. ser., 35 (1913), No. 4, pp. 161-169).—This is an account of several investigations with decoctions made from fallen leaves and pine straw, supplied with 0.5 per cent peptone and 0.5 per cent sugar, rendered neutral or slightly alkaline where necessary, and inoculated with cultivated soil, much richer in bacteria than was the forest soil.

It was found that the growth of bacteria, which was rapid in some cases, was finally checked by the development of several acids, attributed to the activity of the bacteria themselves. It is thought that in decaying forest leaves these acid products are subject to the washing action of rain, which thus favors the limited bacterial action observed at and near the surface of wood soils. The decomposition observable in these upper layers is attributed almost wholly to fungi which are there relatively active. Investigations concerning the possible rôle played by thermophilic bacteria gave but slight results, possibly on account of the rain and coolness prevalent in the summer of 1912. Further investigations of anaerobic bacteria in this connection are contemplated.

The phenomena of fermentation as acts of digestion.—New evidence from the study of denitrification in plants, P. MAZÉ (*Ann. Inst. Pasteur*, 25 (1911), Nos. 4, pp. 289-312; 5, pp. 369-391, figs. 4; *abs. in Bot. Centbl.*, 122 (1913), No. 10, pp. 207, 208).—The author's studies are claimed to lead to the following conclusions:

The addition of nitrates to cultures of denitrifying bacteria does not alter the character of the fermentation. Any resulting change in proportion is attributable to the paralyzing effect of the nitric acid formed on the development of the organisms. The reduction of nitrates by anaerobic bacteria (not all of which are denitrificants) is due to the disengagement of hydrogen. This reduction of nitrates is not necessarily associated with the formation of ammonia. The more active denitrificants are the better adapted to the assimilation of nitric acid. Higher plants reduce nitrates with formation of nitric acid and its gaseous derivatives. In a 0.1 per cent solution of potassium

nitrate these plants disengage oxygen. They are able to assimilate nitric acid, showing normal development on this source of combined nitrogen.

How legume plants get their nitrogen, A. L. WHITING (*Trans. Ill. Hort. Soc., n. ser., 46* (1912), pp. 74-76).—This is a brief report on experiments carried out with inoculated cowpeas showing nodules on the roots, one lot having been exposed to a mixture of oxygen and carbon dioxide, the other to ordinary air.

The results are said to indicate by the growth of the plants that the legumes take their nitrogen from the soil and not through the leaves. Later reports are promised on the results of analyses as to the nitrogen content of each group.

Instructions regarding inoculation by the Royal Institute of Agricultural Botany (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 11* (1913), No. 3, pp. 33-38).—Along with a report on the percentages of success obtained from some experiments carried out, instructions are given for the preparation and use of the bacterial infection material, and also for fungicidal treatment, as applying to grains, beets, clovers, and other legumes.

Chemical treatment of seeds for slow imbibition, E. VERSCHAFFELT (*Rec. Trav. Bot. Néerland., 9* (1912), No. 4, pp. 401-435).—Experiments by the author are said to show that seeds of various species of plants, including nearly all those of the Cæsalpiniaceæ and the Mimosaceæ, which ordinarily offer great resistance to imbibition of water, take up this liquid readily after a preliminary immersion in alcohol or one of certain other organic liquids. This effect is said not to be produced (in a large majority of cases at least) by the extraction of a water-proofing substance. It is thought to be due to the facts that the alcohol, etc., is able to enter the integument through interstices which water can not ordinarily pass, and that in case such substance is miscible with water, the latter will be taken up by it, thus finding access to all parts of the seed.

The influence of radio-activity on germination, G. PETIT and R. ANGELIN (*Compt. Rend. Acad. Sci. [Paris], 156* (1913), No. 11, pp. 903-905).—The authors carried out experiments similar to those of J. Stoklasa (*E. S. R., 29*, p. 130), eliminating, however, the effects of substances dissolved in the water used. They sprouted seeds of rye grass, wheat, and corn between thick sheets of blotting paper, moistened regularly with pure water of known radio-activity obtained by simple exposure in a radio-active fountain. The plants moistened with the radio-active water, after a period varying from 8 to 12 days, showed greater rapidity of growth than did the controls, also in some cases from 2 to 4 times as many rootlets.

The occurrence of callose in root hairs, C. S. RIDGWAY (*Plant World, 16* (1913), No. 4, pp. 116-122, figs. 12).—Having observed thickening in root hairs, the author made a microscopical examination of a number of plants and found callose-thickened root hairs present on three species of *Panicum* grown in ordinary soil, on young plants of maize and oats, and on the newly formed roots of old plants of Bermuda grass. In addition a number of dicotyledonous plants were examined and callose in the root hairs in varying degrees was found in *Pisum sativum*, *Eupatorium capillifolium*, *Oxalis stricta*, *Vigna catjang*, and *Ipomœa quinquefolia*.

Fungi and bacteria were found closely associated with the root hairs of some of the plants examined, but there seems to be no relation between their presence and the callose formation. It is believed that the phenomenon has its causative agent in certain soil conditions, which are to be investigated further.

The vitality of pollen, C. S. CRANDALL (*Proc. Soc. Hort. Sci., 9* (1912), pp. 121-130).—In connection with plant breeding work carried on at the Illinois Station, the author has reported studies on apples, strawberries, and sweet peas in which observations were made on the vitality of the pollen of these

plants. Fruit setting is taken as the basis for determining the vitality of the pollen.

The experiments have run a number of years, and with apples no definite relation was found between the age of the pollen and successful pollination. The percentage of success following the transfer of pollen which varied from fresh to 11 days old ranged from 0 where the fresh pollen was transferred to the flowers to 32 per cent where pollen 11 days old was used. The average of all tests gave 17.62 per cent setting of fruit.

With strawberries the percentage of successful pollinations varied from 52.5 in 1912 to 84 in 1909. With fresh pollen 59 per cent of the pollinations were successful, while 61.5 per cent was attained where the pollen was 4 days old.

With sweet peas summer and winter pollinations were undertaken, in all 11,393 pollinations having been made. The averages of the summer and winter pollinations that successfully set fruit showed but little difference, the range being from 33 to 46 per cent.

From the experiments reported it is stated that the maximum age at which pollen was successfully used was for the apple 11 days, for the strawberry 15 days and 17 hours, and for the sweet pea 6 days in summer and 22 days and 22 hours in winter.

Directions for collecting plants, P. I. RICKER (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 126, pp. 27-35, figs. 5*).—The author describes the various implements needed in the collection of plants and gives special directions for their preparation and drying.

International catalogue of scientific literature. M—Botany (*Internat. Cat. Sci. Lit., 10 (1913), pp. VIII+840*).—This is in continuation of the series previously noted (*E. S. R., 27, p. 31*) and lists more than 7,300 titles of articles on botany, most of which appeared during 1910 and 1911. The American literature seems more adequately treated than in previous numbers.

FIELD CROPS.

Influence of various fertilizer salts on the germination of field crop seeds, A. RUSCHE (*Jour. Landw., 60 (1912), No. 4, pp. 305-365*).—Twenty-four kinds of fertilizer salts, including chlorids, nitrates, sulphates, carbonates, and phosphates, were tested at the rate of 10 gm. per pot (containing 11.5 kg. of soil), with barley, beans, beets, alsike clover, red clover, white clover, blue lucern, blue lupines, oats, peas, rape, rye, serradella, and wheat. Numerous tables show the results of seed germination, length of root, weights of above-ground and underground parts, ratio of root weight to remainder of plant, and relation of root length to weight. The water capacity of the soil was maintained at 70 per cent.

The influence of the various salts upon germination was as follows: Potassium chlorid did not produce an unfavorable influence on the germinating ability of the cereals, peas, kidney beans, rape, or beets, but the energy of germination was somewhat suppressed. With the clovers, serradella, alfalfa, and lupines this salt worked unfavorably. Sodium chlorid, except with barley, lupines, serradella, and rape, also worked unfavorably, being especially harmful to white clover, red clover, alsike clover, and alfalfa, but was particularly advantageous on lupines. Magnesium chlorid produced, in general, effects similar to potassium chlorid, although the germination figures were a little higher with alfalfa, red and white clover, and serradella, and considerably lower with lupines. Calcium chlorid also had a similar effect to potassium chlorid, except with beets, which showed fewer germinations than with potassium chlorid. In comparison with magnesium chlorid, calcium chlorid gave a

lower germination figure with the clovers, excepting with red clover and serradella. Ammonium chlorid had an injurious effect on beets, the most with clovers and the least with rye.

Potassium nitrate had a noticeably better effect than potassium chlorid, and this was especially marked in the germinating energy. There seemed to be no noticeable difference between the influence of these 2 salts on clovers and lupines. The influence of the nitrate of soda on the germination figure was similar to that of potassium nitrate, but the energy of germination declined, especially with kidney beans and white and alsike clovers. Calcium nitrate worked similarly to potassium nitrate, favorably on alfalfa and serradella, and unfavorably on lupines and alsike clover. Ammonium nitrate was similar in influence to ammonium chlorid.

Potassium sulphate produced favorable results in general, being injurious only to serradella. Sodium sulphate had a similar effect, but the germinating energy was somewhat less, although with serradella a greater number of germinations occurred than with potassium sulphate. Magnesium and calcium sulphates had generally good effects on all the seeds, while ammonium sulphate seemed injurious to the clovers, serradella, and rape.

Of all the salts, sodium carbonate and potassium carbonate produced the most beneficial effect on germination, especially as regards the energy of germination. Sodium phosphate had in general an effect similar to sodium sulphate, but a specially beneficial influence on the germination ability of all seeds was observed, and an injurious effect on white clover. Calcium phosphate had a favorable influence; only with lupines could a lower germination figure be detected. Ammonium phosphate had a good effect in general, working injuriously only with clovers, serradella, and rape. A more or less injurious effect on the germinating energy of all the seeds was noticed with the phosphate salts.

A 40 per cent potash salt produced, with the exception of alsike clover, somewhat better results than did potassium chlorid. Kainit in general produced a better effect on germination than the 40 per cent salt, and especially so with serradella. Thomas slag, superphosphate, and ammonium phosphate had a more or less favorable influence. The germinating energy seemed to be more favorably affected by Thomas slag than by the other two, although it was noted that Thomas slag had a slightly injurious effect on lupines, due to the calcium it contained.

The influence of each salt on the root development was as follows: With the cereals the nitrates apparently produced the shortest roots, the chlorids somewhat longer, the sulphates and phosphates the longest, and the carbonates an intermediate growth. Of the bases, potash produced the best and ammonia the poorest root growth. With beets the greatest root system was produced by sulphates and the smallest by ammonium nitrate, ammonium phosphate, calcium nitrate, and sodium phosphate. With the peas the largest roots were found on the unfertilized plants. The length decreased with the sulphates and the nitrates produced the shortest. With kidney beans the ammonium salts worked the most unfavorably, and the potassium salts most favorably. With clovers the sulphates, carbonates of potassium, sodium, and magnesium, and also sodium nitrate produced the longest roots. The remaining nitrates, and especially the phosphates and chlorids, showed a much shorter root growth. A small growth was also noted with calcium and ammonium salts and sodium chlorid. In general, alfalfa presented a similar development, but the sodium salts and ammonium phosphate almost always proved injurious and the magnesium chlorid proved beneficial. With lupines the chlorids and carbonates, with the exception of sodium chlorid, produced beneficial results, while magnesium and calcium compounds, with the exception of calcium nitrate, worked

adversely. The shortest roots were produced by the ammonium and potash compounds. The root lengths of serradella were injuriously affected by chlorids and nitrates, all the potash compounds, and ammonium sulphate, while sodium phosphate and magnesium phosphate produced a favorable growth. With rape the sulphates, phosphates, and carbonates produced the longest roots, and the chlorids of potash, calcium, and ammonium the shortest.

The influences of each fertilizing salt upon the development of the above-ground parts are noted as follows: With rye, potassium and ammonium salts worked the best, and sodium the poorest of the bases, while the carbonates and phosphates produced the best and the chlorids the poorest results of the acid compounds. With oats the greatest weights were obtained with ammonium sulphate and phosphate, and the lightest weights were made with chlorids and sulphates, with the exception of ammonium sulphate. With barley, ammonium sulphate produced the best growth, followed by sodium phosphate, while the reverse influence was observed with the sulphates of sodium and magnesium and the chlorids of magnesium and calcium. When beets were fertilized with nitrates the growth was the greatest, but the least with the carbonates. Sodium showed the best growth of the bases and calcium the poorest. With peas, potash and magnesium salts made the best growths, while ammonium salts, with the exception of sulphate of ammonia, produced the poorest. With kidney beans the carbonates gave the best results and the chlorids the poorest of the acids, while of the bases, potash and sodium compounds were the best and those of magnesium the poorest, especially magnesium sulphate. With red clover, the growth was unfavorably influenced by the chlorids and nitrates, with the exception of ammonium nitrate. The greatest amount of growth was produced with the alsike clover when fertilized with phosphates; chlorids and nitrates proved injurious. Alfalfa was favorably influenced only by potassium sulphate, potassium carbonate, and sodium carbonate, while all other fertilizers had an injurious effect, especially the ammonium compounds. Sodium phosphate and calcium phosphate had a favorable effect on the growth of lupines, while ammonium phosphate did not. The chlorids and nitrates were unfavorable to the growth of serradella, while the sulphates, carbonates, and phosphates were not. Rape growth was greatly favored by potassium nitrate, and injured by chlorids and all of the ammonium salts, especially ammonium sulphate.

On the significance of variety tests, C. BARUS (*Science*, n. ser., 36 (1912), No. 923, pp. 318-320).—This article is a discussion of the value of variety tests as carried out and recorded by experiment stations. It is pointed out that 2 kinds of influences determine observed yield, viz, the innate capacity of the variety and the conditions of growth to which it is exposed. The author suggests that a concerted and systematic effort be made on the part of those interested in agricultural science to put this important problem on a sound basis biologically and statistically, and presents tabular data showing the deviation of yields of varieties from the yearly means and from their own means in different years.

Deep cultivation, R. DUMONT (*La Culture Profonde*. Paris [1912], pp. 104, figs. 33).—This book describes the different methods that may be employed in plowing, subsoiling, and surface cultivation, giving costs of the various operations and the seasons at which they should be performed. The author advocates greater depth of plowing, and describes systems in practice on many farms in France.

Seeing the light at Anderson, W. A. DU PUY (*Country Gent.*, 78 (1913), No. 16, pp. 623, 624, figs. 4).—This article describes methods of increasing soil productivity used on a southern farm. Chiefly by deep plowing, good seeding, green manuring, and rotation, the yields were increased from 12 bu. of corn

and $\frac{1}{2}$ bale of cotton per acre to 30 bu. of corn and $\frac{1}{4}$ bale of cotton the second year. The system of rotation divided the farm into 3 parts, viz. (1) cotton, followed by oats to plow under; (2) corn, followed by cowpeas to plow under, followed by oats; and (3) oats harvested, followed by cowpeas for hay, followed by oats to plow under.

The work of the Yuma Experiment Farm in 1912. W. A. PETERSON (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 126, pp. 15-21, figs. 2*).—The work done since the establishment of this farm at Yuma, Ariz., in 1909, giving general crop conditions and plan of the farm, is discussed.

It is noted that fields sown to alfalfa with a grass seed drill usually produced a uniform stand. The heaviest yields of alfalfa seed were frequently obtained from fields badly infested with Bermuda grass, due, it is pointed out, to the more isolated position of the plants.

In eradicating Bermuda grass the best method was found to be to give a thorough shallow plowing during the summer months, followed by occasional diskings. "Bermuda grass will grow where the underground water during the flood stage of the Colorado River comes practically to the surface, a condition disastrous to most other crops. It also withstands a rather high alkali content in the soil, and on account of the rapidity with which it spreads when it once secures a scattered foothold it should prove useful in reclaiming alkali areas. On such areas, where alfalfa does not do well, Bermuda grass has a distinct value as a pasture crop, since the forage is highly nutritious and the plants very resistant to the effects of close grazing."

In cotton experiments it is noted that the plant can be reproduced from mature wood cuttings and that plants can be volunteered by protecting the bases of the stems with soil during the winter.

In corn experiments selection 157, a strain of Laguna corn, appeared to be better adapted to the climatic conditions than any other variety tried.

Miscellaneous crops. W. A. PETERSON (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 126, p. 25*).—On spots of medium and heavy soils hemp grew from 10 to 20 ft. high and seeded abundantly. Two species of bamboo did not prove hardy. Carob (*Ceratonia siliqua*) is indicated as being a promising introduction from Spain.

The work of the Delta Experiment Farm in 1912. J. P. IRISH, Jr. (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 127, pp. 3-13, fig. 1*).—This paper includes a description of the region of the Delta experiment farm at Middle River, California, and the cropping systems.

Results are given of potato experiments in 1912, in continuation of previous work (*E. S. R., 20, p. 948*). In fertilizer and cultural trials rather uniformly higher yields were obtained with superphosphate under all conditions of tillage and uniformly better yields in proportion to stand by applying the fertilizer in March over applying fertilizers at planting time. Deep plowing showed better results than shallow, and green manure gave generally better yields than were obtained from bare fields. The use of varying rates of superphosphate produced no consistent differences in yield. The growth of haulm, however, was noticeably increased by the heavier application.

In an experiment in which sulphuric acid was used to acidulate the irrigation water, the applications of from 500 to 900 lbs. per acre were made at a time when the tubers were beginning to form. The immediate effect of the acid was a marked increase in the vegetative vigor of the plants. This stimulation continued during the remainder of the growing period, so that at harvest time the haulm was double that of any other plots in the field. The wilt infection of these plots was not only uniformly lower than on the rest of the field, but the growth of the infected plants was also much less depressed. It

is noted that these results taken in conjunction with the lateness of the application, the moderate price of sulphuric acid, and the ease of application, suggest a promising field for further work.

In a depth-of-plowing test, the yields with 6-in., 12-in., and 18-in. plowing were respectively 4,370, 5,405, and 5,978 lbs. of market potatoes per acre. In a depth-of-planting test plowing with deep planting (8 in.) gave better results than shallow planting (4 in.), but the results with deep plowing were contradictory. In a comparison of local and imported seed the yield from Oregon seed was decidedly higher and the stand was better.

Field experiments at the moor experiment station, TACKE (*Protokoll Cent. Moor Com.*, 68 (1912), pp. 61-69).—In a test of the value of calcium nitrite for rye, the yield with 50 kg. of nitrogen in calcium nitrite per hectare was 1,330 kg. of grain, and 2,670 kg. straw per hectare, as compared with 2,120 kg. of grain and 4,540 kg. of straw following 50 kg. of nitrogen in nitrate of soda, 1,910 kg. of grain and 3,960 kg. of straw following 25 kg. of nitrogen in nitrate of soda, and 1,500 kg. of grain and 3,570 kg. of straw produced without nitrogen. In a study of spacing drain lines in meadows, plots with drains placed 40 meters apart gave a yield of 5,650 kg. per hectare of air-dried hay, as compared with 5,150 and 4,340 kg. with drains 20 and 30 meters apart. In a cultivation test of meadows where 2,500, 3,500, and 5,500 kg. of lime was applied per hectare, the best results were obtained with the medium application of lime plowed shallow (10 to 12 cm.) and thoroughly incorporated with the soil, in comparison with no plowing and deep plowing (20 cm.).

[Field crops], W. BERSCH (*Ztschr. Moorkultur u. Torfverwert.*, 11 (1913), No. 1, pp. 11-28, pl. 1).—Field experiments with potatoes, comfrey, Helianthus, peppermint, cereals, beets, cabbage and other vegetables are described and briefly discussed.

In moor field experiments at Admont it was found that newly broken ground could be immediately seeded to meadows and permanent pastures with a profit without first being cultivated with a hoed crop. An average yield of 6,780 kg. per hectare (3 tons per acre) of hay was secured by this method during the 5 years from 1908-1912, inclusive.

Catch crops, T. WIBBERLEY (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 12 (1912), No. 4, pp. 732-742).—This article is a discussion of practical ways of using different catch crops, designed to aid farmers to adopt a more intensive system of agriculture. Various systems of catch crop rotations are suggested.

Cooperative tests of alfalfa from Siberia and European Russia, N. E. HANSEN (*South Dakota Sta. Bul.*, 141, pp. 36-157, pls. 21).—This bulletin reports in detail cooperative tests of some of these alfalfas.

A method of transplanting 1-year-old alfalfa plants into the field instead of sowing seed is described, in which plants were set by machine at the rate of 100 per minute. Some of the advantages of this method over seeding are pointed out as (1) a much smaller quantity of seed is necessary (apparently less than 5 lbs. per acre); (2) there is an increased yield of seed, over 1,000 lbs. per acre being possible; (3) the field can be kept free from dodder; and (4) as the plants may be set 2 ft. apart in rows that are 3 ft. 8 in. apart cultivation is easy. As many as 500 shoots were found on a single plant set in this way. A more favorable root development was also obtained by transplanting than by seeding in the field, as disking injures the crowns by splitting them down and the crowding of plants by the seeding method injures the yields, through crowding the roots as well as the tops.

It was observed that seeds of *Medicago falcata* germinated very irregularly, some remaining in the ground a long time due to the dry, hardened condition of the seed coat. Experiments with a seed scratching machine, by means of

which the seed coats were mutilated, gave satisfactory results. Freezing the seeds immediately before planting also increased germination.

Reports of the cooperative tests of natural hybrids between the blue and yellow flowered alfalfas that occur in Asia and Southern Europe are given in detail. These hybrids get their names from the region from which they come and are reported under the names of Semipalatinsk, Cossack, Chernob, Orenburg, Samara, Omsk, and Obb. The history of the introduction of Turkestan, Siberian, and Russian alfalfa is also given.

Alfalfa inoculation tests, C. W. PUGSLEY (*Nebraska Sta. Bul.* 136, pp. 3-8, figs. 2).—This bulletin reports cooperative experiments carried on during 1910 and 1911, to test the value of pure cultures, soil, and barnyard manure in the production of alfalfa.

From the results obtained, the use of farm manure in proper amounts and properly applied is strongly recommended, and where difficulties have been experienced in securing a good stand or vigorous growth of alfalfa, inoculation has proved successful. Inoculation with soil from a well-established alfalfa field gave uniformly better results than were secured by the use of liquid cultures.

A Mendelian study with beets, B. KAJANUS (*Fühling's Landw. Ztg.*, 61 (1912), No. 4, pp. 142-149).—In studying the form factors the various types of form, as tapering, blunt, cylindrical, and wedge-shaped, were crossed and the manner in which these segregated in the offspring was noted. Four different and independent form factors were observed, 2 of which seemed to act on the diameter of the beet and 2 on the length. Any one of the factors may appear separately, or there may be an appearance in any combination.

In a study of color factors the author crossed stock beets of various colors, ranging through white, yellow, and red. The yellow crosses produced yellow in the first generation, and in the second segregated into 15 yellow and 1 red, in a similar way as certain crosses in the study of forms. Also, the yellow seemed to have 2 independent factors producing different color tones.

Similar experiments with turnips are reported and discussed.

The action of different fertilizers on the exterior appearance of beets, H. ROEMER and G. WIMMER (*Sucr. Indig. et Colon.*, 80 (1912), No. 16, pp. 365-369).—This paper reports observations made at the agricultural station at Bernburg.

Among the more important results noted are that an excess of nitrogen produced an increased growth of 3 to 4 times during July to October, varying with the weather conditions. An excess of potash produced irregular and injurious results, showing specially critical periods during September. When fertilized early with phosphoric acid the leaves took on a very dark color, and as they approached the dying stage turned a reddish hue.

The influence of light on the growth of beet seeds, F. STROHMER (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 8 (1912), Sect. Va, pp. 79-83).—Three beets of similar size and shape, containing an equal percentage of sugar, were cut in half longitudinally, and one-half of each beet was planted in the open and the other half in the shade of a tree. The beets in the direct sunlight gave much better seed yields than those in the shade, ranking as 100 to 25.5, 26.4, and 6.1, respectively. An examination did not show any noteworthy difference in the quality of the seeds.

Beet seeds, J. J. WEISS (*Ztschr. Zuckerindus. Böhmen*, 36 (1912), No. 11, pp. 645-650).—This paper is a discussion of the causes of the varying results obtained in testing beet seeds in regard to their germinating ability and energy. Variations in seed of the same plant are attributed to the character of the indi-

vidual seeds, which differ according to the size, location on the stem, and degree of ripeness of the seed bolls.

As a means of securing more comparable results the author advises (1) that the germinative ability of beet seeds be reckoned on weight rather than on number of seed bolls; (2) that the conditions of the test take a more liberal form; and (3) that in making the determinations of germinative ability a somewhat greater latitude be given.

The inheritance of quantitative characters in maize, R. A. EMERSON and E. M. EAST (*Nebraska Sta. Research Bul. 2, pp. 5-120, figs. 21*).—This bulletin discusses somewhat fully the inheritance of quantitative characters and presents data bearing upon this subject secured from experiments with maize conducted by the authors working separately. The materials used were a strain of Tom Thumb pop, Missouri dent, California pop, Black Mexican sweet, Watson flint, Leaming dent, Illinois low protein, Illinois high protein, Early Crosby, Sturges flint, and Longfellow flint.

It is noted that the results secured from the experiments were what might well be expected if quantitative differences were due to numerous factors inherited in a strictly Mendelian manner. Real genetic correlations in the sense of gametic associations are not antagonistic to the Mendelian doctrine.

In a study of 8 different crosses the parents varied from 8 to 20 rows and in nearly every case F_1 was intermediate between the parents, though in the case of one cross of the 8-rowed variety with an apparently 12-rowed variety the latter condition seemed to dominate. In most cases the F_2 generations had a wider range of variation than F_1 , a range that included both parent types. The differences between the F_2 families of a single cross are believed to have been due to heterozygosis of one or other of the parent varieties. Where F_2 families were grown the parent types were recovered in every case and intermediate types were also seen.

In the study of inheritance of length of ears, in each case the ear length of one parent was approximately two and a half times that of the other parent. In the cross of Tom Thumb with Black Mexican the F_1 ear length was distinctly intermediate between the parental ear lengths. In the cross of Missouri dent with California pop the F_1 generation had ears practically as long as those of the long-eared parent, but the extreme length of the F_1 ears was doubtless in part due to heterozygosis, for the means of the F_2 families were distinctly intermediate between the parental means. In every case the F_2 fraternities were more variable than the F_1 lots.

The inheritance of diameter of ears was investigated in 2 crosses. The ears of F_1 were intermediate in diameter between those of the parents but somewhat nearer the larger-eared than the smaller-eared variety. The F_2 ranges of variation little more than filled the gap between the parent races. The parent types were not recovered in F_2 , but the several F_2 lots were very distinct. The smallest ears of the largest eared F_2 families were larger than the largest ears of the smallest eared families.

Weights of seed were determined only for the cross Tom Thumb-Black Mexican. It is noted that the seeds taken to represent the latter variety were probably too large owing to previous mixture of strains. If allowance is made for this the F_1 seed weight was only a little below the mid-parental weight, and the ranges of variation of the F_2 fraternities well overlapped the ranges of the parents. One F_2 family had a seed weight nearly equal to that of Black Mexican and the great variability of several F_2 lots indicated heterozygosity sufficient to enable the isolation of the parent types on further selection.

Breadth of seeds was noted in the crosses of Missouri dent with California pop and with Tom Thumb. In both cases F_1 was distinctly intermediate between the parents in breadth of seed. F_2 generations showed a markedly greater variability than F_1 or the parents.

Four different crosses were employed in the studies of the inheritance of height of plants. A peculiarity of these crosses was that in 3 of them the F_1 plants were almost as tall as the tall parent and in the fourth were considerably taller than the mean of the 2 parents. It is stated that this increase in height of the F_1 plants over the mid-parental height was in no case ascribable to dominance of tallness over shortness, but was due rather to increased vigor accompanying heterozygosis as indicated by the fact that in every case the mean height of the F_2 plants was about half way between the heights of the parents and as also shown by the lack of skewness in F_2 frequency distributions. Practically all of the F_2 fraternities overlapped in height the inner extremes of their parents. The F_2 families were very diverse in height and in variability.

A study of internode lengths explains the excess in height of F_1 plants over the average of the parent heights. Although the number of nodes in F_1 was apparently always distinctly intermediate between the parent numbers, the internode length was so greatly increased by heterozygosis that F_1 plants were often nearly as tall as the tall parent plant, and always taller than the average of the parent heights.

In 2 crosses, one parent of which produced numerous tillers and the other few tillers, F_1 was intermediate in number of stalks per plant. In both crosses F_2 was more variable than F_1 and in one cross the F_2 range was from 1 to 8 stalks, while 5 was the largest number observed in the parent variety that tillered most freely. Among the F_2 families a few were practically one-stalked types and a few others had a somewhat larger mean number of stalks than the tillering parent and a range of variation so great as to suggest the possibility of isolating by selection a type with a still larger number of stalks. On account of the fact that in one cross the tall parent was a few-stalked type and the short parent a many-stalked type, the 2 parent varieties did not differ greatly in total length of stalks per plant.

In earliness F_1 plants were intermediate between their parents and the F_2 generations more than filled in the gap between the parents in all cases where exact records were made. It is observed that numerous apparent correlations, genetic as well as physiological, have been encountered in these experiments and many of them have been noted incidentally in the detailed discussions of results.

"We have reason to believe, for instance, that length of ear is directly correlated with height of plant and inversely correlated with number of rows per ear. Number of rows seems also to be related in some way to the character of the endosperm, since in some crosses segregates with a large number of rows have dent grains while those with few rows have flinty grains. It is apparent also that, while height of plant and number of stalks per plant may not be directly related, number of stalks and diameter of stalks are negatively correlated. Our records indicate that there is little if any correlation, either genetic or physiological, between duration of growth and internode length. There is also little or no physiological correlation between duration of growth and number of nodes, but apparently a distinct genetic correlation between these 2 characters. In 1911, families of corn, which from previous selfing were approaching a condition of homozygosis of factors for size and duration of growth, showed a slight negative correlation between number of nodes and duration of growth, while F_2 families, heterozygous for both number of nodes and for duration of growth, showed a marked positive correlation between these characters.

If height of stalk alone had been considered instead of number of nodes and internode length it might have been thought, in case of these F_2 families, that the unfavorable weather of early summer, by checking the growth of the early plants, and the favorable weather of late summer, by increasing the growth of the late plants, had brought about an apparent rather than a real correlation. But since the number of nodes is determined before the plant has made much growth, this character could not have been influenced by the differences between the weather of early and that of late summer. It is not that one set of conditions made the early plants have few nodes and another set made the late plants have many nodes, but rather that some of the genetic factors that caused the plants to have a large number of nodes were associated with the factors (or were themselves the factors) that caused prolonged growth. . . . The inter-relations of such characters as number of rows per ear, circumference of ear, and breadth of seeds are obvious."

A bibliography is appended.

Variety tests of corn, J. L. BURGESS (*Bul. N. C. Dept. Agr., 34 (1913), No. 2, pp. 16*).—This bulletin reports cooperative tests of 29 varieties of corn, and gives suggestions on the selection and preparation of seed, breeding plat, preservation of the seed, germination tests, planting, and varieties. The yields reported in these experiments ranged from 10.5 to 45 bu. per acre.

How to grow an acre of corn, C. P. HARTLEY (*U. S. Dept. Agr., Farmers' Bul. 537, pp. 21, figs. 12*).—This gives simple directions especially designed for boys, covering the kind of corn to grow, selecting the seed, the land, and the fertilizer; preparing the seed bed, planting, thinning, cultivation, combating cutworms, seed selection, care of seed corn, and determination of yield.

American corn growing methods in Bessarabia, J. H. GROÛT (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 79, p. 109*).—This paper mentions the failure of American maize to ripen a crop in numerous cooperative experiments on account of an early cold wave. Italian maize, however, matured and was shocked before the cold wave with good yields.

Local fertilizer experiments with cotton in south Alabama in 1912, J. F. DUGGAR, J. T. WILLIAMSON, and L. J. HAWLEY (*Alabama Col. Sta. Bul. 169, pp. 3-42*).—Continuing previous work (*E. S. R., 27, p. 33*), it is noted that of the 21 conclusive tests, in 2, "on prairie (lime) upland soil, kainit was highly effective, while cotton-seed meal and acid phosphate were also important. In 2 experiments made on comparatively fresh sandy land (second and fifth years since clearing), acid phosphate was the fertilizer constituent that was most profitable. In 1 experiment on red rocky soil in Greene county, no potash was needed, but both phosphate and cotton-seed meal profitably increased the yield.

"In 1 experiment on noncalcareous reddish soil near Greensboro, and in 1 test on sandy loam near Tallassee, nitrogen was the only fertilizer constituent that notably increased the yield. In 14 other conclusive experiments located south of Montgomery, all on old grayish sandy soils of the Coastal Plain Region, kainit was needed as one constituent of the fertilizer in 93 per cent of the tests; kainit and acid phosphate were about equally effective in 50 per cent of these tests; and kainit was more important than acid phosphate in 43 per cent of these tests; nitrogen was highly effective as one constituent of the fertilizer in 79 per cent of these experiments on old sandy land. . . .

"It was more effective and more profitable in 1912 to apply 200 lbs. of kainit in a complete fertilizer than to use only 100 lbs. of kainit. The average of the conclusive experiments shows that 200 lbs. of cotton-seed meal applied before planting was in 1912 very slightly more effective than 100 lbs. of nitrate of soda applied after the plants were 6 in. high."

Local fertilizer experiments with cotton in north Alabama in 1912, J. F. DUGGAR, J. T. WILLIAMSON, and L. J. HAWLEY (*Alabama Col. Sta. Bul.* 170, pp. 45-74).—Continuing previous work (*E. S. R.*, 27, p. 34), tests conducted on 7 soil types are reported in tabular form.

It is noted that in 14 out of 16 conclusive experiments, cotton-seed meal was more effective than either acid phosphate or kainit. In 75 per cent of the experiments acid phosphate was needed to a greater or less extent, and in 44 per cent kainit was needed to a greater or less extent.

"It was more effective and more profitable in both years to apply 100 lbs. of kainit in a complete fertilizer than to use 200 lbs. of kainit. The average of the conclusive experiments shows that 200 lbs. of cotton-seed meal applied before planting was in 1912 practically equal in effect to 100 lbs. of nitrate of soda applied after the plants were 6 in. high."

The dasheen, a root crop for the Southern States, R. A. YOUNG (*U. S. Dept. Agr., Bur. Plant Indus. Circ.* 127, pp. 25-34, figs. 3).—Continuing earlier work (*E. S. R.*, 22, p. 631), this paper reports subsequent trials of this crop in the United States. In 1912, a total yield of 1,200 bu. was obtained from 7 acres. Analyses show that the corms and tubers are similar to the potato in composition, but as they contain less water the content of starch ($27\frac{3}{4}$ per cent), as well as of protein (3 per cent), is roughly a half higher. The plant is described and its cultural requirements, harvesting, grading, storage, and utilization are discussed.

Irish potato investigations, 1909-1913, T. H. WHITE (*Maryland Sta. Bul.* 172, pp. 105-120, figs. 4).—This bulletin supersedes Bulletin 132 (*E. S. R.*, 21, p. 136), and contains some additional notes on recent experiments.

The average yields of 4 varieties during the years 1910-1912 were 171.7 bu. per acre of "primes" from seed grown in Garret County, Md., 139.4 bu. from the Maine grown seed, and 130.6 bu. from home-grown seed.

In a test to compare cold storage with cellar storage of seed potatoes it was shown that those from cold storage produced a much higher percentage of stand and larger yields than the cellar stored seed. Seed from which the sprouts had been rubbed off gave slightly larger yields than those with the sprouts left on. Variety tests during 1910, 1911, and 1912 gave average yields for the 3 years ranging from 106.1 to 195 bu. per acre of "primes" with early planting, and with late planting, from 97.1 to 236.9 bu. per acre.

Directions for cultivating, fertilizing, and controlling diseases and insects are given.

The culture of rice on the Kasai River, Congo Free State, E. MESTDAGH (*Bul. Agr. Congo Belge*, 3 (1912), No. 3, pp. 533-537, figs. 5).—This paper reports the methods employed by the natives and discusses cultivation methods, harvesting, storing, and improving the crop.

The mineral composition of cane at various times of the year, P. BONAME (*Sta. Agron. Mauritius Bul.* 26, 1911, pp. 28-59).—This report gives tabulated results of analyses showing the content of mineral matter and nitrogen of 2 varieties of cane harvested in May, June, July, August, September, and November, both of the plant as a whole and of the stem, leaves, and heads, on the basis of green material and dry matter, together with total yields. The total yield of dry matter showed a steady increase throughout the season, while there was an increase of mineral matter during the first 3 months, followed by fluctuations. Similar results were observed with the nitrogen content.

Three-year cultivation experiment with various Squarehead varieties of wheat, G. BÖHMER (*Arb. Deut. Landw. Gesell.*, 1912, No. 224, pp. 188).—This publication reports 158 experiments carried on in various parts of Germany

under the direction of the German Agricultural Association from 1905-1907, inclusive. The average yields of grain of the 3 best varieties were in 1905, 2,593 kg. per hectare (2,308 lbs. per acre); in 1906, 2,954 kg.; and in 1907, 2,426 kg.

Intensive cultivation of grain, J. DUMONT (*Ann. École Nat. Agr. Grignon*, 2 (1911), pp. 62-66).—In an experiment on the intensive cultivation of grain it was found that the yield depended upon 3 factors, the number of stems per given area, the strength of the stem, and the weight of the grain. Planted in hills and cultivated, 25 hills per square meter gave 200 stalks, each yielding an average of 48 kernels that weighed about 2.5 gm., equivalent to about 50 quintals per hectare (4,450 lbs. per acre). With the ordinary cultivation there were often more than 300 stalks per square meter, yielding only 25 kernels each, and weighing about 1 gm., equivalent to only about 30 quintals per hectare.

The wild oats (*Avena fatua*), A. ZADE (*Arb. Deut. Landw. Gesell.*, 1912, No. 229, pp. 91, pls. 18).—This treatise gives an exhaustive study of the wild oats, with discussions covering morphology, development, occurrence, relationship to the cultivated variety, and methods of eradication.

In germination tests the wild oats was found to germinate best when in the milk stage, with a percentage of 44, as against 22 per cent in the yellow ripe stage. As to depth of planting, from 5 to 10 cm. was more favorable than any other depth down to 30 cm., when germination ceased.

In a study to discover an intermediate form between the wild and cultivated oats, 61 plants were grown from seed of *A. fatua* and 27.9 per cent showed the *sativa* type, 54.1 per cent the intermediate type, and 18 per cent the *fatua* type. The following year 1,600 seeds in 40 series of 40 seeds each were planted from these 61 plants, with practically the same results. The intermediate type series gave 27.2 per cent of *sativa* type, 51.7 per cent intermediate type, and 21.1 per cent *fatua* type. The *sativa* type series divided into 2.5 per cent intermediate, 97.2 per cent *sativa*, and 0.3 per cent *fatua* type. The *fatua* type series divided into 2.2 per cent intermediate type, 97.8 per cent *fatua*, without any of the *sativa* type.

Weeds of cultivated soils, O. WEHFARG (*Arb. Deut. Landw. Gesell.*, 1912, No. 226, pp. 87).—This publication reports results of investigations of soils in various parts of Germany as to weed seeds, and the length of time the various kinds may lie dormant in the soil. The soils were divided into 3 general classes, (1) soils which for many years had not been used for cultivated crops and produced only a few or no weeds; (2) those long under cultivation that produced weeds to some extent; and (3) weedy soils recently brought into intensive cultivation. The work covers a period from 1905 to 1907, inclusive.

Tabulated results are given for soils from sugar beet fields and for cereal fields. The author concludes that the hardness of the different kinds of weed seeds varies considerably, and that the germinating of certain varieties takes place within definite time limits.

The Maryland seed law, C. P. SMITH (*Maryland Sta. Bul.* 170, pp. 71-79).—This bulletin includes the text of the Maryland seed law, which became effective October 1, 1912, and the regulations formulated for its enforcement, together with a brief discussion of the advantages of seed inspection.

The control of agricultural seeds in Switzerland, J. LONG (*Jour. Bd. Agr.* [London], 19 (1912), No. 9, pp. 726-732; *Jour. Dept. Agr. So. Aust.*, 16 (1913), No. 7, pp. 773-778).—This paper gives a description of the methods employed to test seeds, and notes that seeds are sent to Zurich for examination from every important European country, as well as from the United States. Tables show

the average results of examinations of clovers, trefoil, and grasses since 1876. Of the grasses, timothy possessed the highest record of purity and germination, 98 and 93 per cent, respectively. The germinating tests ran as low as 0, with the lowest purity record at 5.5 per cent. One hundred and forty-nine varieties of seeds have been tested since the establishment of the station, and 171 firms are under special contract with the station for the examination of their seeds.

HORTICULTURE.

[Fruit and vegetable tests at the Yuma Experiment Farm in 1912], W. A. PETERSON (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 126, pp. 21-24, figs. 2*).—Both figs and dates are being tested in considerable numbers on the farm. Three thousand date seedlings of desirable varieties have been planted, together with offshoots from 15 varieties of imported date palms. The difficulty which was experienced in getting transplanted offshoots to grow has been largely overcome by planting the offshoots in soil having good drainage and then irrigating every other day during the summer months. In the work with figs more than 1,000 seedling crosses between the Smyrna and common varieties of figs have been planted in orchard form with the object of securing some new varieties possessing the excellent qualities of the Smyrna but not requiring pollination through the agency of the Blastophaga. The minimum temperature of 16° F. killed nearly all the seedling figs to the ground during the winter of 1911-12. The seedlings were carried through the winter of 1912 successfully, however, by withholding irrigation water from the fig orchard from about the first of August, thus preventing late growth.

Most of the varieties of vegetables recommended for planting in the Southwest have been successfully grown when planted during the proper season. A test of 3 species of eucalypts in the overflow land between the levees of the Colorado River is resulting successfully. All 3 species have done well notwithstanding a 3-ft. overflow and extremes in temperature, varying from 16 to 120° F. The general planting in this region of small acreages of eucalypts for fence posts and fuel, as well as for ornamental purposes, appears to be warranted.

The horticultural industry at Ghent, R. DELMOTTE (*Rev. Econ. Internat., 10 (1913), II, No. 1, pp. 7-28*).—An account of the history and evolution of horticulture in the vicinity of Ghent, Belgium.

[Vegetables at Wisley] (*Jour. Roy. Hort. Soc. [London], 38 (1913), No. 3, pp. 561-581, pl. 1*).—Brief descriptive notes are given of various kinds of melons, potatoes, vegetable marrows, and miscellaneous vegetables tested at the Wisley Gardens in 1912.

Cauliflower and cabbage cultivation, A. J. PINN (*Dept. Agr. N. S. Wales, Farmers' Bul. 68, 1913, pp. 20, figs. 9*).—A popular treatise on cultural methods, with special reference to conditions in New South Wales. A separate discussion of the insect pests of these crops, by W. W. Froggatt, is included.

Preliminary report on winter cauliflower, G. L. TIEBOUT (*Louisiana Stas. Bul. 140, pp. 19, figs. 2*).—A report on the culture and marketing of winter cauliflower, based upon cultural experiments conducted by the station. The following phases are discussed: Climate and soils, seed, varieties, preparing the soil, sowing the seed in seed beds and in the field, transplanting and planting operations, fertilizing, cultivating, blanching, harvesting, trimming, grading, packing, shipping, yields, profits, markets, and insects.

Chicory, V. GRAFE (*Monatsh. Landw., 6 (1913), No. 5, pp. 133-143*).—An account of the chicory plant with reference to its botany, culture, composition,

and uses. Data are also given showing the influence of different soils on the chemical composition of the root.

Tomato variations induced by culture, T. H. WHITE (*Maryland Sta. Bul.* 173, pp. 121-133, figs. 5).—Some experiments conducted during the past few years with reference to the effect of pruning, feeding, and temperature on variation in plants are reported. They include a study of the effect of excessive amounts of nitrogen, phosphoric acid, and potash, separately and in combination, on the variation of tomatoes and beans; studies of the effect of temperature on Acme tomato variation, and of the effect of pruning on sweet peas and tomatoes; a study of the effect of dried blood, dissolved phosphate rock, sulphate of potash, separately and in combination, and of iron filings on Red Cherry tomatoes; and a study of the effect of cross-pollination upon well-fed and starved plants.

The following general conclusions are derived from the investigations as a whole: "From the work done it would appear that only one of the treatments, that of the fertilizers on Red Cherry tomato, made any permanent changes in the character of the plants worked with. There can be no doubt, however, that in the case of Red Cherry, treated with dried blood, there is permanent variation to the third generation. Mutilation as in the pruning, also starvation and high feeding, as in the well-fed *v.* starved, do not seem to have had any permanent effect. In following this work it is evident that there is better control of conditions when plants are grown in pots. In the outdoor work where rainfall is variable, control is difficult."

Orchard management, U. P. HEDBICK (*New York State Sta. Circ.* 24, pp. 12).—A popular discussion of the general principles of orchard management.

Planting trees with dynamite, A. J. FARLEY (*Proc. N. J. State Hort. Soc.*, 38 (1912), pp. 83-88).—The first year's results from experiments conducted with apple and peach trees at the New Jersey Stations are reported.

With peach trees planted at the Vineland substation the average growth of the dynamited trees the first season was 794 in., as compared with an average growth of 655 in. for trees planted in the ordinary way. In all cases the ground was thoroughly plowed before planting. In another test in the same orchard there was a difference ranging from 652 in., or over 54 ft., of growth to 1.397 in., or over 116 ft., of growth per tree in favor of dynamiting.

Similar results were obtained with peaches at New Brunswick, whereas the apple trees showed practically no difference in the amount of growth between the trees planted with dynamite and those planted in the ordinary way. In all the tests made the percentage of trees living through the first season was practically the same under both methods of planting. The cost of planting was about 5 cts. greater per tree for the dynamited trees. Although no conclusions are drawn from the 1 year's results, the author is of the opinion that the use of dynamite for planting fruit trees is worthy of a thorough trial.

Horticultural research.—III, The action of grass on trees, S. PICKERING (*Sci. Prog. Twentieth Cent.*, 7 (1913), No. 28, pp. 490-503, pls. 5, fig. 1).—A popular discussion of the results secured in the author's investigations relative to the effect produced by growing grass above the roots of fruit trees (E. S. R., 28, p. 640).

Smudging costs, T. R. WOODBRIDGE (*Pacific Rural Press*, 85 (1913), No. 21, pp. 588, 589).—Cost data are given for smudging operations conducted in 3 California citrus groves during the winter of 1912-13.

The setting and dropping of fruits (*New York State Sta. Circ.* 22, pp. 12).—This circular comprises a popular discussion of the various factors influencing the setting of fruit buds and the dropping of immature fruits.

Cooperation and fruit growing, A. McNEILL (*Canada Dept. Agr., Branch Dairy and Cold Storage Comr. Bul.* 38, 1913, pp. 46).—A revised edition of Bulletin 18 of this series (E. S. R., 19, p. 144) to which considerable new matter relative to cooperative marketing has been added.

Nomenclature of fruit (*Fruit World Austral.*, 14 (1913), No. 5, pp. 144-146).—This comprises lists compiled under the direction of the Australasian Pomological Committee of apples and pears suitable for planting in Victoria, South Australia, New South Wales, and Tasmania. The synonyms and the preferred names adopted for a number of apples and pears are also included.

The influence of cold on the conservation of the olive, G. SANI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 22 (1913), I. No. 7, pp. 459-464).—Having previously determined that cold arrests the lipolytic activities of the enzymes contained in the fruit of the olive, the author conducted more extensive tests to determine the possible use of cold storage as a means of prolonging the oil pressing period without affecting the quality of the oil. The investigation is here summarized, and shows that oil of good quality may be expressed both from olives which have been allowed to remain on the tree several weeks after the normal harvest period when the weather is cool, and when the olives have been picked at the normal period and placed in cold storage for several weeks.

Establishment of northern vineyards and forcing houses by the use of American grape stocks, P. GERVAIS (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 21, pp. 643-657).—A discussion of the adaptability of American grape stocks for the reestablishment of the viticultural industry in northern France. The author concludes that by the judicious selection of American stocks the old-time grape industries of the above region may be easily renewed.

Experiments on the resistance of coffee to native weed growth and on its growth in the shade of trees, M. S. BERTONI (*Agronomia [Puerto Bertoni]*, 5 (1913), No. 3-4, pp. 119-128).—The experiments here reported were conducted at the agronomic station of Puerto Bertoni, Paraguay, during the period 1909 to 1912.

The data given indicate that coffee plants are not only resistant to native vegetation but also that they thrive better where the vegetation is removed only once or twice a year than where it is removed 3 or 4 times. A certain amount of shade appears to be necessary for the best development of the coffee. The more frequently weed growth is removed, the greater the amount of shade required.

Observations on the preparation of cacao, E. PERROT (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 18, pp. 1394-1396).—Some preliminary experiments conducted by the author and here briefly summarized indicate that the fermentation process employed in freeing cacao beans from the pulp and to promote the development of theobromin in the beans may be practically done away with by a mechanical separation of the seed from the pulp and sterilizing the beans with steam. The author has found it perfectly possible to obtain in vitro in the powder of beans thus sterilized transformations comparable to those which are produced in the seed in the usual course of fermentation.

The Philippine coconut industry, O. W. BARRETT (*Philippine Bur. Agr. Bul.* 25, 1913, pp. 67, pls. 19, figs. 2).—The present bulletin embodies the principal features of the author's previous bulletin (E. S. R., 26, p. 743) and other articles on various phases of coconut culture,* together with considerable later information regarding cultural methods, statistics, and management of coconut plantations.

* Philippine Agr. Rev. [English Ed.], 5 (1912), No. 5, pp. 243-288, pls. 6.

Relationships of the false date palm of the Florida Keys, with a synoptical key to the families of American palms, O. F. COOK (*U. S. Nat. Mus., Contrib. Nat. Herbarium*, 16 (1913), pt. 8, pp. VII+243-254, pls. 4).—Though the characters of the fruits and the germinating seedlings afford consistent and substantial evidences of the affinity of the false date palm (*Pseudophoenix surgentii*) with the ivory and coconut palms, it is concluded that no very close alliance can be established, and consequently *Pseudophoenix* is here assigned to an independent position in the classification as representing a new and distinct family, *Pseudophoenicaceæ*. Outlines are given of a general treatment of all the American palms.

[Flowering plants at Wisley] (*Jour. Roy. Hort. Soc. [London]*, 38 (1913), No. 3, pp. 549-560).—Brief descriptive notes are given of a large number of *Pelargoniums*, dahlias, and miscellaneous flowering plants tested at the Wisley Gardens in 1912.

Bigenic hybrids between *Cooperia* and *Zephyranthes* produced at the Agricultural and Horticultural Society's gardens, Alipore, Calcutta, S. P. LANCASTER (*Jour. Roy. Hort. Soc. [London]*, 38 (1913), No. 3, pp. 531, 532).—A number of hybrid forms between the above genera are here described.

Double flowers, MISS E. R. SAUNDERS (*Jour. Roy. Hort. Soc. [London]*, 38 (1913), No. 3, pp. 469-482, pls. 6).—A discussion of doubling in various classes of flowers, with special reference to the hereditary transmission of doubling.

Lilies, H. S. ADAMS (*New York*, 1913, pp. 116, pls. 16).—A popular monograph on lilies for the garden and greenhouse, including a descriptive account of the various subgenera, species, varieties, and hybrids and the essential cultural details, including the specific requirements of different types. A brief bibliography of lilies is appended.

Household gardens and other small garden enterprises in their significance for town and country, J. KAUP, J. ALTERNATH, O. MICHALKE, ET AL. (*Schr. Zentralst. Volkswohlfahrt*, 1913, No. 8, pp. VI+364, pls. 17, figs. 6).—This work comprises a compendium of information relative to the activities and methods employed by various municipalities, employers, associations, and individuals, principally in Germany, in the betterment of living conditions in crowded communities by the establishment of playgrounds, recreation grounds, garden settlements, school gardens, etc. The subject matter was prepared under the auspices of the Central Station for Public Welfare, and the report of the sixth conference of this station is included.

Gardens for small country houses, GERTRUDE JEKYLL and L. WEAVER (*London and New York*, 1913, 2. ed., rev. and enl., pp. L+260, pl. 1, figs. 429).—A popular treatise on garden design, based on a study of numerous gardens in England. The text is fully illustrated.

Insecticides, fungicides, and weed killers, E. BOURCART, trans. by D. GRANT (*London*, 1913, pp. XXXV+431, figs. 12).—A practical manual of the diseases of plants and their remedies, for the use of manufacturing chemists, agriculturists, arboriculturists, and horticulturists. The present edition has been translated from the French, revised, and adapted to British standards and practices. The subject matter of the manual is based upon the literature of experiments with insecticides and fungicides. A glossary of the principal diseases of plants and the parasites which occasion them is annexed to the work.

The Arizona horticultural law and its applications concerning the importation of plants, A. W. MORRILL (*Ariz. Hort. Com. Circ.* 16, 1911, pp. 24).—This circular discusses the requirements of the Arizona horticultural law and the interpretations placed upon its provisions in regard to the inspection of imported plants.

Biennial report of the state horticultural commission of the State of Utah from December 1, 1910, to November 30, 1912 (*Bien. Rpt. State Hort. Com. Utah, 1911-1912*, pp. 48).—In addition to information relative to nursery inspection work, including a financial statement for the biennial period, a statistical survey is given of the orchard and nursery industries of the State. The data given show the number of fruit trees of various kinds planted in each county during the past 2 years, bearing and nonbearing orchard acreage, nursery stock and planting operations, foreign seedlings inspected, trees and fruit contaminated, cost of county inspection work, freight rates, etc.

Rules and regulations for carrying out the plant quarantine act (*U. S. Dept. Agr., Office Sec. Circ. 44*, pp. 16).—This circular comprises a revision of the regulations for the enforcement of the plant quarantine act of August 20, 1912 (*E. S. R.*, 27, p. 845) and contains the text of the act as amended March 4, 1913 (*E. S. R.*, 28, p. 302), and a list of state inspection officials.

FORESTRY.

Alaska woods, their present and prospective uses, B. E. HOFFMAN (*Forestry Quart.*, 11 (1913), No. 2, pp. 185-200).—The author enumerates the various species of trees found in the National Forests in Alaska, and calls especial attention to the present and prospective values of the several species which occur in abundance in the coastal forests.

Ecological studies on a northern Ontario sand plain, A. B. CONNELL (*Forestry Quart.*, 11 (1913), No. 2, pp. 149-159).—A systematic study of the forest types in the Nipissing region, Ontario, based upon data resulting from field practice work of forestry students of the University of Toronto.

Method of a forest survey and estimate in Nova Scotia, K. M. CLARK (*Forestry Quart.*, 11 (1913), No. 2, pp. 201-208).—The forest survey and estimate here discussed in detail covered about 200,000 acres divided into 2 working areas of about 120,000 and 75,000 acres, respectively.

The timber lands of Panama, F. LINDSAY (*Bul. Pan Amer. Union*, 36 (1913), No. 4, pp. 499-510, figs. 11).—A general description is given of the timbered areas in Panama, together with brief descriptions of such varieties of Panama woods as occur in quantities sufficient for export purposes.

Some aspects of European forestry, A. B. RECKNAGEL (*Forestry Quart.*, 11 (1913), No. 2, pp. 135-148).—In continuation of a previous paper on this subject (*E. S. R.*, 28, p. 744), the present paper discusses the management of pine in Prussia and of spruce in Saxony.

Progress report of forest administration in the Andamans for 1911-12, J. L. BAKER (*Rpt. Forest Admin. Andamans, 1911-12*, pp. IV+36).—This is the customary progress report relative to the constitution, management, exploitation, and administration of the state forests of the Andamans, including a financial statement for the year. All important data relative to alterations in areas, forest settlements, surveys, working plans, miscellaneous work, yields in major and minor forest products, revenues, expenditures, etc., are appended in tabular form.

Annual administration report of the forest department of the Madras Presidency for the twelve months ending June 30, 1912, A. W. and P. M. LUSHINGTON, J. S. BATTIE, and F. A. LODGE (*Ann. Admin. Rpt. Forest Dept. Madras, 1912*, pp. 82+CXXV+19).—Data corresponding to the above are presented for the state forests in the Northern, Central, Southern, and Western Circles of the Madras Presidency for the year 1911-12.

A new conception on the causes of diameter growth, P. JACCARD (*Naturw. Ztschr. Forst u. Landw.*, 11 (1913), No. 5-6, pp. 241-279, pls. 4, figs. 2).—The

author takes exception to the opinion advanced by Metzger^a that the trunk and branches of trees are developed as pillars of equal resistance against wind pressure, and concludes from his own observations that the development of any particular form in a tree should be regarded as the attempt to establish a shaft with equal water-carrying capacity and that the form of a tree is dependent upon the combined influence of all climatic factors acting on the turgor power of the tree. The physiological action of light through which transpiration and assimilation are mainly promoted should be regarded as the measuring factor for the form of the tree rather than the mechanical action of wind.

Planning experiments on the influence of stand density as well as various silvicultural practices upon the moisture and humus content of our forest soils from a practical standpoint, D. TIEMANN (*Allg. Forst u. Jagd Ztg.*, 89 (1913), May, pp. 153-165).—After pointing out the interdependence of light and soil as factors in the development of timber stands, the author submits outlines of some 20 experimental projects dealing with stand density and soil improvement, the solution of which it is believed, will be of great value to the forester.

Winter storage of acorns, A. OPPERMANN (*Forstl. Forsögsv. Danmark*, 4 (1913), No. 2, pp. 127-133, fig. 1).—A number of small samples of acorns intended for breeding purposes were stratified in sand and stored over winter in a sand pile. The unusually severe winter temperature, which at one time fell as low as -20° C., resulted in the destruction of many of these samples by frost. A subsequent examination of the samples showed that the acorns which were allowed to dry out too much before being stored were more seriously damaged. Hence the author concludes that a certain degree of moisture is requisite to the resistance of acorns to frost. This opinion appears to be substantiated by the fact that many acorns which were left unprotected in the open under relatively moist conditions sprouted in the spring notwithstanding the severe winter temperatures.

Although no data were secured relative to the degree of frost to which the different samples were submitted and the amount of injury which occurred in each case, the results of other observations indicate that many acorns are killed when submitted to a temperature of -7° .

A way to improve the quality of pine seed, BUSSE (*Ztschr. Forst u. Jagdw.*, 45 (1913), No. 5, pp. 300-313).—The author here maintains that the absolute weight of specified samples of seed is one of the factors in determining the quality of pine seed. By the use of a centrifugal machine he has been able to separate samples of pine seed into 3 separate weight classes. In a germination test of the 3 separate grades very little difference in the germinating power was noted, the small inferior seed giving slightly higher results. On the other hand, the root development of the seedlings decreased directly with the grade of the seed.

In conclusion the author briefly describes the grading of seed with a fan separator as conducted at a seed house in Regentin-on-the-Frankfort.

The growth of red pine in Ontario, A. H. D. ROSS (*Forestry Quart.*, 11 (1913), No. 2, pp. 160-171, fig. 1).—This comprises height, diameter, and volume data based upon stem analyses and measurements of red pine growing in the Nipissing region, Ontario.

Observations on the inception, season, and duration of cambium development in the American larch (*Larix laricina*), L. KNUDSON (*Bul. Torrey Bot. Club*, 40 (1913), No. 6, pp. 271-293, pls. 2, figs. 3).—This paper is based upon

^a Mündener Forstl. Hefte, 1893, No. 3, p. 55; Naturw. Ztschr. Forst u. Landw., 6 (1908), No. 5, p. 249.

the results of investigations begun during the season of 1909 and continued in 1911 with the object of determining the part of the tree in which cambium activity begins, as well as to determine the season of growth.

From observations made during the 2 seasons and from the results of other investigators, the author is inclined to the opinion that in general diameter growth does not begin until the leaves have been fully developed and have become sufficiently active in food making to supply the requirements of rapid cell formation. The results thus far secured are considered insufficient to establish the region of the tree in which cambium activity first begins.

Studies on the anatomical structure of woods of Japanese conifers, M. FUJIOKA (*Jour. Col. Agr. Imp. Univ. Tokyo*, 4 (1913), No. 4, pp. 201-236, pls. 7).—The various species studied are described with reference to their macroscopic and microscopic wood structure and they are fully illustrated by a photographic series of cross, tangential, and radial wood sections. A bibliography of literature on wood structure is also given.

Experiments in the preservative treatment of red-oak and hard-maple crossties, F. M. BOND (*U. S. Dept. Agr., Forest Serv. Bul.* 126, pp. 92, pls. 9, figs. 26).—The experiments here described were conducted by the Forest Service in cooperation with the University of Wisconsin and the Chicago, Milwaukee, and St. Paul Railway.

Part 1 of the bulletin describes the treatment of the ties and discusses the data of immediate value obtained during the application of the preservatives. Part 2 contains a description of the test track and tabulated records essential for an analysis of the durability data which will be obtained in future inspections. The preservative processes employed included at least one from each general type of pressure process in common use. Treatments were begun in October, 1910, and completed in May, 1911. The track was laid in August, 1911.

The following are among the general conclusions derived from the preservative treatments: Under the same conditions of treatment a given absorption per cubic foot of wood was obtained in a shorter time in hard-maple than in red-oak ties. For a given treatment there is a greater variation of absorption between individual ties of hard maple than those of red oak. Variations in red-oak ties tended toward an excessively high rather than an excessively low absorption. The penetration of preservative in hard-maple ties was largely in the sapwood and in the seasoning checks and was very erratic in the heartwood. In red-oak ties there appeared to be no relation between the absorption of preservative per cubic foot and the proportion of sapwood in the ties, the amount of absorption being in inverse proportion to the moisture content and oven-dry weight. Absorption was also slightly greater as the average number of annual rings per inch increased. The absorption of preservative per cubic foot of wood in hard-maple ties having nearly equal proportions of sapwood increased as the oven-dry weight per cubic foot decreased. The oven-dry weight per cubic foot of red-oak ties increased as the average number of annual rings per inch decreased. The rate of loss in weight after treatment was greater for red-oak than for hard-maple ties treated in a similar manner with creosote only or with the gas-house oil used in these experiments, but the rate of loss was much greater for hard-maple than for red-oak ties treated in a similar manner with aqueous solutions of zinc chlorid.

Considerable data are appended dealing with accuracy of the various determinations, errors in measurements by float gauges, and analyses of preservatives.

Forest products of Canada, 1912.—Pulp wood, R. G. LEWIS and W. G. H. BOYCE (*Dept. Int. Canada, Forestry Branch Bul.* 38, 1913, pp. 20, figs. 4).—As in similar reports (*E. S. R.*, 27, p. 443) a statistical account is given of the quantity and value of the pulp wood produced in the Dominion according to the Provinces

in which it was produced, the species used, and the method of manufacture. Data are also given on the exports and imports of pulp wood and of the pulp wood exported from the Dominion and the several Provinces in an unmanufactured state. Comparative data are given for 1911. The report contains a map showing the location of the pulp mills of the Dominion.

Forestry literature published in 1912 (*Skogsvårdsför. Tidskr., Fackafsd., 1913, No. 3, pp. 242-257*).—This bibliography includes publications on the various phases of forestry published in the English, French, German, and Scandinavian languages.

DISEASES OF PLANTS.

Diseases of cocoes and other crops, S. F. ASHEY (*Bul. Dept. Agr. Jamaica, n. ser., 2 (1913), No. 6, pp. 150-155*).—The author describes some diseases of cocoes, coconuts, cacao, coffee, and sugar cane.

The disease of cocoe previously noted and attributed to *Hormiscium colocasæ* n. sp. (E. S. R., 28, p. 746) is described, and the author states that later investigations have shown that the fungus was not properly identified. He proposes for it the name *Vasculomyces xanthosomæ* n. sp.

The coconut diseases described are the leaf diseases due to *Sphærella zonata* and *Pestalotzia* sp., a disease of leaf bases and terminal buds due to *Lasiodiplodia theobromæ*, and a disease of the trunks caused by *Thielaviopsis paradoxa*. Other diseases described are *Cephaleurus mycoidea* and *L. theobromæ* on cacao, *S. coffeicola* on coffee, *Leptosphaeria sacchari* and *Cercospora sacchari* on sugar cane, and a disease of date palms due to *Graphiola phoenixis*.

Rot bacteria associated with diseases of tropical plants, J. A. HONING (*Centbl. Bakt. [etc.], 2. Abt., 37 (1913), No. 14-16, pp. 364-384, pl. 1, figs. 2*).—The author has isolated and described a number of rot bacteria that were found associated with diseases of tobacco, sesame, peanuts, teak, and *Polygala butyracea*. In all, 16 species of bacteria were isolated, and the following new species are described: *Bacterium stalactitigenes*, *B. langkatense*, *B. deliense*, *B. sumatranum*, *B. patelliforme*, and *B. rangiferimum* on tobacco; *B. medanense* on peanut; *B. aurantium-roseum* on tobacco and peanut; *B. schüffneri* on tobacco, sesame, and *P. butyracea*; *B. zinniioides* on tobacco, peanut, and sesame; and *Corynebacterium piriforme* on tobacco and teak. Technical descriptions of all the organisms are given.

A new species of Sterigmatocystis, G. BAINIER and A. SARTORY (*Ann. Mycol., 11 (1913), No. 1, pp. 25-29, pls. 3*).—The authors discuss a fungus studied by them which is classed as *S. sydowii* n. sp. It is said to prefer banana, carrot, and licorice, growing also on potato and several artificial substrata on addition of small quantities of glycerin or acids. Its optimum growth is reached at or near 28° C., growth ceasing entirely at 41°.

Myrioconium scirpi n. g. and sp., C. FERDINANDSEN and Ö. WINGE (*Ann. Mycol., 11 (1913), No. 1, pp. 21-24, figs. 5*).—A study made of the fungus formerly classed as *Sphacelia scirpicola* leads the authors to the conclusion that this may be taken as the type of a new genus, this form receiving the name *M. scirpi*.

The extension of Puccinia geranii in geographic-biological races, P. MAGNUS (*Ber. Deut. Bot. Gesell., 31 (1913), No. 2, pp. 83-88, pl. 1*).—As a result of studies reported to the author or made by him on *P. geranii* in widely separated regions, the conclusion is reached that this is a well characterized species morphologically, slight morphological differences appearing only in southern Asia. In particular localities it forms constant biological races, confining itself to certain hosts. This is thought to be connected with its forming each year but

one generation of spores, and its adaptation to climatic conditions in the elevated regions where it is usually found.

Report on the wintering over of rust fungi in the uredo stage, E. BAUDYŠ (*Ann. Mycol.*, 11 (1913), No. 1, pp. 30-43, figs. 3).—Continuing work previously noted (E. S. R., 28, p. 345), the author found that *Puccinia dispersa* on rye survived the winter of 1911-12 (the minimum temperatures being somewhat lower than those of the previous winter, both mycelium and uredospores showing early capacity for reproductive activity. A bibliography is appended.

Influence of "pickling" on the germination of cereals, J. C. JOHNSON (*Jour. Bd. Agr. [London]*, 20 (1913), No. 2, pp. 120-124).—A series of experiments conducted at the University College, Cork, is described, in which an attempt was made to determine the action of formaldehyde and copper sulphate solutions on the germination of wheat, barley, and oats. Various strengths of solutions and times of application were tested, the formaldehyde varying from 0.06 to 2 per cent solutions and the copper sulphate from 0.25 to 5 per cent solutions, and the times of application for the different lots ranging from 5 minutes to 3 days.

On comparing the two series of experiments it was found that formaldehyde affected germination adversely according to its concentration. The more marked depression in germination was due to copper sulphate. Grains treated with copper sulphate took about twice as long to germinate as those treated with formaldehyde. Of the formaldehyde solutions, 0.125 per cent seemed the best for practical purposes, as it did not diminish germination appreciably after 15 minutes' immersion of the seed and proved to be a good fungicidal strength.

Anthraxnose of sisal hemp, F. J. F. SHAW (*Agr. Jour. India*, 8 (1913), No. 1, pp. 65-68, pls. 3; *abs. in Agr. News [Barbados]*, 12 (1913), No. 289, p. 174).—A description is given of a disease of agaves due to *Colletotrichum agaves*.

Inoculation experiments showed that the disease in question was due to the above fungus, but that it was necessary to injure the surface of the leaf in order to secure infection. This seems to indicate that the fungus is a wound parasite. As the leaves frequently crack during periods of hot dry weather, it is thought that infection by the fungus would be facilitated in this manner. Collecting and burning the diseased leaves and spraying with Bordeaux mixture are recommended for checking the disease.

Hop mildew, F. M. BLODGETT (*New York Cornell Sta. Bul.* 328, pp. 281-310, figs. 19).—The results are presented of a study of the hop mildew, due to *Sphaerotheca humuli*, in which the economic importance of the disease, life history of the fungus causing it, and methods of control are described.

Among the observations reported, attention is called to the early infection of the lower leaves from the winter fruit bodies and the subsequent infection of the younger growing parts of the hop plant, particularly the flowering catkins. The fungus causing this disease can not be distinguished by any morphological characters from that causing mildew on a large number of weeds, but cross-inoculation experiments showed that the fungus is highly specialized, the strain attacking hops being confined to that plant and to the Japanese hop and entirely unable to attack other plants.

For the control of the mildew proper sanitation in the hop yards is said to be essential. Beginning in 1910 experiments with fungicides were conducted and confined mostly to the use of sulphur, as liquid sprays were considered impracticable. In 1911 the use of sulphur and sulphur and lime was compared, with the result that 61.2 per cent of the hops were free from mildew where sulphur alone was applied and 12.3 per cent where sulphur and lime was used, while in the check all hops were more or less infected. In 1912 comparisons were made between flowers of sulphur, such as is generally used, and "flour sulphur,"

which is a finely ground form of sulphur that has been recently placed on the market. The results obtained from the use of these two forms of sulphur were practically identical, so that there is little choice between them. One disadvantage of the flour sulphur is its tendency to form into lumps, as this necessitates thorough screening before its use.

An account is given of tests of sulphuring machines, times for application, amounts of sulphur to be used, etc.

Diseases and enemies of peanut, A. CHEVALIER (*Jour Agr. Trop.*, 13 (1913), No. 141, pp. 72-76).—The author reports, along with various insect pests of peanut in Senegal, a plant parasite which lives on the roots of this legume, forming clumps from 15 to 30 cm. in height, considered to be closely related to *Alectra senegalensis* and described under the name *A. arachidis*; also a fungus, *Septoglaum arachidis*, thought to be probably identical with that otherwise named *Cercospora arachidis* and *C. personata*. It is said to cause spotting and fall of the leaves and to be most abundant in years of great humidity.

Potato leaf roll due to necrosis of the phloëm, H. M. QUANJER (*Meded. Rijks Hoogere Land, Tuin en Boschbouwsch.* [Wageningen], 6 (1913), No. 2, pp. 41-80, pls. 8).—As a result of several years' physiological and anatomical study made on potatoes of several varieties affected with leaf roll, the author concludes that potato leaf roll is not due to a specific organism, but that the changes observed in the phloëm of plants showing leaf roll are the result of some slight chemical or physical disturbance in the cell, possibly connected with illumination, transpiration, and certain other factors, some of these probably being hereditary.

Silver scurf, a disease of the potato, I. E. MELHUS (*U. S. Dept. Agr., Bur. Plant Indus. Circ.* 127, pp. 15-24, figs. 4).—Attention is called to a little known disease of potatoes, which is becoming widespread in the United States. This disease, called silver scurf, is caused by attacks of *Spondyloccladium atrovirens* on the tuber. In the early stages of infection the fungus causes blackish olive patches on the surface of the potato, which often cover considerable areas. In the later stages of development small black sclerotia are formed, and the surface of the discolored areas takes on a silvery or glistening appearance, due to the raising of the cells of the outer layers by the mycelium of the fungus. As the disease progresses the infected areas increase and the fungus penetrates deeper into the tuber. As a result often the whole surface of the tuber is discolored, shrunk, and shriveled.

For the control of this disease experiments with formalin and corrosive sublimate treatments were carried on, in which at least double the ordinary strength of these solutions used for controlling potato scab was employed without destroying the spores of the fungus. Neither did dry heat at a temperature of 50° C. for 5 hours kill the fungus. Further experiments are in progress to test the possible value of formalin as a means of controlling this disease.

A bibliography is appended.

Fungus diseases liable to be disseminated in shipments of sugar cane, ETHEL C. FIELD (*U. S. Dept. Agr., Bur. Plant Indus. Circ.* 126, pp. 3-13, figs. 7).—A description is given of some of the more important diseases which are thought liable to be introduced into this country through the importation of sugar cane from foreign countries. Among the diseases mentioned are the red rot of the stem, iliau, gumming, smut, sereh, pineapple disease, Sclerotium disease, and root and rind diseases.

Red rot fungus and the sugar cane in the West Indies (*Agr. News [Barbados]*, 12 (1913), Nos. 286, pp. 126, 127; 287, pp. 142, 143; 288, pp. 158, 159).—An account is given of experiments carried on by F. W. South and W. R. Dunlop to reconcile some of the conflicting views to be found in literature

relating to the parasitology of the red rot fungus of sugar cane (*Colletotrichum falcatum*).

As a result of their investigations it is found that the fungus in the West Indies is a facultative wound parasite, the degree of parasitism varying according to climatic conditions, age, and particularly with the variety of cane. The chief injury done is in consequence of its invert action on cane sugar, tending to increase the glucose ratio. The chief mode of infection seems to be through the agency of boring insects, or through wounds caused by other means.

The experiments are held to show that the disease is not communicated by infected cuttings. The presence of the fungus in cuttings of mature canes seems to stimulate shoot development and the growth of roots at the base of the shoots, apparently in order that the new plant may cut itself off from the source of infection. The chief danger from planting infected cuttings seems to lie in the fact that the soil becomes infected with the fungus, thereby increasing the chance of the disease being communicated by boring insects. While it is thought that this disease may be perpetuated through diseased cuttings in other regions, it is not considered probable that it is transmitted in this way in the West Indies.

The fire blight disease in nursery stock, V. B. STEWART (*New York Cornell Sta. Bul.* 329, pp. 315-371, figs. 15).—A description is given of the fire blight of pomaceous trees, due to *Bacillus amylovorus*, with particular attention to its effect on nursery stock. The disease is most destructive on the cultivated varieties of the pear, apple, and quince, and special attention is given to these plants.

Fire blight in nursery districts is becoming very prevalent, and in some cases entire blocks of apples, pears, and quinces were destroyed in 1908. In the nursery the disease is said to be most commonly found affecting the twigs, the one exception being the two-year-old and three-year-old quince stocks, which often flower profusely.

Detailed descriptions are given of the etiology of the disease, the results of cultural studies on the organism, its life history, etc.

The disease is largely distributed by insects and pruning tools, and seems favored by certain weather conditions as well as cultivation and manuring of the plants, which produce rapid, succulent growth. As a result of 4 years' work in the nursery the author believes it is profitable to give careful attention to the fire blight. Eradicating the hold-over blight, removing quince blossom buds, and the frequent inspection of diseased areas will reduce the disease.

A bibliography of the subject is appended.

The control of canker in the orchard, J. R. COOPER (*Nebr. Hort.*, 3 (1913), No. 3, pp. 1, 2).—Suggestions are given for the control of cankers in orchard trees, particularly the blister canker, bitter rot canker, and black rot canker. The methods described involve proper sanitation in the orchard and removal and destruction of infected parts, followed by proper sterilization or other treatment of cut surfaces.

Injury to orchard trees by crown gall, E. A. BACK (*Rpt. State Ent. and Plant Path. Va.*, 8 (1910-11), pp. 31-39, pls. 19).—Attention is called to an experiment begun in 1906, which was planned to ascertain certain facts regarding the crown gall of fruit trees.

Careful notes were taken in the spring of 1906 on 180 trees diseased with crown gall which exhibited every gradation of the disease. Some of the trees died outright, while notes were taken on the others. On October 23, 1909, of 114 trees that were still living, 85 were found so badly affected by crown gall that they had made no good root system. The remaining lot were not badly affected,

but it is believed that the disease will develop within a few years. The observations upon these trees are to be continued.

The perfect stage of *Cylindrosporium* on *Prunus avium*, B. B. HIGGINS (*Science*, n. ser., 37 (1913), No. 956, pp. 637, 638).—In the fall of 1910 the author began a study of *Cylindrosporium* as it occurs on species of *Prunus* in the region of Ithaca, N. Y., in order to discover the life history and relationship of the organism on the different hosts. Several sweet cherries that had been severely attacked during the previous summer by *Cylindrosporium* were noted and the fallen leaves examined at different periods during the following winter. In March developing fruit bodies were noticed in abundance on many leaves, and after being brought into the laboratory the fruit bodies showed mature asci. Ascospores taken from the fruit bodies and placed in drops of water on the leaves of *P. avium* seedlings in the greenhouse gave typical infection, and later similar results were obtained in pure cultures.

For the perfect stage of the fungus the author proposes the name *Coccomyces hiemalis* n. sp., a technical description of which is given.

Causes of deterioration of grapevine in Sicily.—I, On the effects of falls of temperature on grapevines in connection with bramble leaf, L. PETRI (*Ricerche sulle cause dei deperimenti delle viti in Sicilia. I. Contributo allo studio dell' azione degli abbassamenti di temperatura sulle viti in rapporto all' arciamento. Rome, 1912, pp. 110, figs. 97; rev. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 1, pp. 137, 138*).—Regarding the endocellular fibers observed (E. S. R., 28, p. 245) in all American and European grapevines in Sicily and on the mainland affected with bramble leaf, or roncet, the author states that these formations are identical with those found in the wood of conifers; that these fibers are not found in vines affected with other forms of distortion; that their formation precedes the external manifestations of roncet; that they are transmitted by cuttings; that this formation is caused by falls of temperature during growth; that the distortion of the shoots produced directly by the late frosts is not the same morphologically or genetically as that due to roncet; that the sensibility of the tissues due to sudden cold is greater after the first injury; and that these changes are the results of an alteration of a normal process which continues and is transmitted to newly formed cells, independently of a repetition of the cold. It has not hitherto been found possible to prove experimentally that roncet and the endocellular fibers are due to the same cause. It is thought that soil structure, shape, etc., found to be favorable to roncet, may be predisposing or complementary factors in its production by cold.

Black rot of grapes, A. PRUNET (*Rev. Vit.*, 39 (1913), No. 1000, pp. 228-232).—This is a brief discussion of the biological characters of black rot in comparison with those of downy mildew, *Oidium*, and anthracnose.

It is stated that the primary infection, due to the dispersal of ascospores living over from attacks of the previous summer, and which do not usually appear after flowering begins, is more important from a standpoint of control than is the secondary infection, from pycnidiospores which appear later. The control of this disease may be secured, it is said, by spraying the vines affected with copper sulphate or sulphuric acid until the blooms appear.

Botrytis cinerea, G. LAFFORGUE (*Rev. Vit.*, 39 (1913), No. 1001, pp. 245-254; *Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 30, pp. 104-115).—This is a brief discussion of gray rot of grapes, its forms, symptoms, effects, biology, and treatment.

The loss to the crop of 1912, attributed by some observers largely to downy mildew, is held by the author to have been due mainly to gray rot caused by

B. cinerea. A formula recommended in combating this fungus is a powder of lime, 85 per cent. with permanganate of potash, 15 per cent. A second formula given replaces 5 per cent of the permanganate by an equal proportion of alum. Several other formulas are given.

Incubation period of *Plasmopara* on grapevines with reference to control of leaf fall, G. VON ISTVÁNYFI (*Bot. Közlem. [Budapest]*, 12 (1913), No. 1, pp. 1-7, (1)-(3)).—The author gives the results of investigations during the years 1911 and 1912, which are in substantial agreement, regarding the incubation period of *Plasmopara* as affected by seasonal changes.

It is stated that in Hungary the length of the period between infection and the appearance of the flecks on the leaves, which usually precedes the appearance of the conidiophores, was found to be, early in May, from 15 to 18 days; late in May, 12 to 15 days; early in June, 11 to 13 days; middle of June, 9 to 11 days; end of June, 6 to 7 days; and July and August, 5 to 6 days. On blooms and grapes the infection period was longer, being, early in June, from 12 to 14 days; middle of June, 9 to 11 days; end of June, 10 to 12 days; and early in July, 12 to 14 days, the later lengthening of the period in this case being attributed to the increasing resistance of the berries. High temperature tended to shorten the period, as did also high humidity. The author advises the application of fungicides beginning with the first appearance of the oil flecks, which, however, do not always appear, especially in very moist weather. See also a previous note (E. S. R., 27, p. 47).

The germination of winter spores of *Plasmopara viticola*, L. RAVAZ and G. VERGE (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 10, pp. 800-802).—The authors describe the mode of germination of the winter spores of *P. viticola* observed by them. They also give what is claimed to be a simple method of observing such germination, recommending that some such method be utilized as a means of foretelling the primary invasion of downy mildew of the grape, with a view to timely protective measures.

Banana diseases in Jamaica, S. F. ASHBY (*Bul. Dept. Agr. Jamaica, n. ser.*, 2 (1913), No. 6, pp. 95-128, pls. 8).—Descriptions are given of the Panama disease, black spot disease, banana wilt, blackhead disease, dry rot of bulbs, Maramius rot, and heart leaf disease of bananas.

The Surinam Panama disease of the Gros Michel banana, A. W. DROST, trans. by S. F. ASHBY (*Bul. Dept. Agr. Jamaica, n. ser.*, 2 (1913), No. 6, pp. 128-149, pls. 11).—This is a translation of a bulletin previously noted (E. S. R., 27, p. 50).

The situation in the citrus district of Batangas, P. J. WESTER (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 3, pp. 125-130, pls. 5).—In 1911 the attention of the Bureau of Agriculture was called to an outbreak of blight among the citrus trees in Batangas Province. In this region the cultivation of the trees had been badly neglected, a volcanic eruption had covered a considerable area with ashes, and a severe drought, all combined, had seriously affected the citrus industry.

The principal trouble, aside from that due to neglect, is described as bark rot. This disease makes its appearance on the trunk and larger branches, and the first indication of its presence is the oozing out of the sap from the bark and the formation of a putrid sore at the point of attack. The disease is said to resemble in many ways the foot rot that has been destructive to citrus trees in other parts of the world, yet it differs from that malady in that it extends from the ground well up into the tree, does not attack small trees, and does attack the mandarin orange, which is considered practically immune to the foot rot. A study of fresh material has failed to reveal the presence of a

fungus or bacterium, and it is thought probable that the trouble is of physiological origin.

Better attention to the trees, removal of all dead wood, cultivation, fertilizing, etc., will, it is believed, improve the condition of the trees and reduce the amount of injury.

A second contribution to the study of gummosis of orange, M. S. BERTONI (*Agronomia [Puerto Bertoni]*, 5 (1913), No. 3-4, pp. 93-97).—The author gives a second report (E. S. R., 28, p. 651) on gummosis of orange, distinguishing between this trouble and foot rot as seen in the United States. It is stated that orange gummosis is a disease of defective nutrition and may be caused or favored by poverty of soil or lack of certain elements of fertility; by lack of water, or its excess with poor drainage; by acidity of soil; by poor cultivation, resulting in an impermeable layer near the surface; or by other conditions affecting the normal course of nutrition, and that it may be prevented or remedied by proper drainage, fertilization, etc.

Silver thread blight of coffee in Surinam, J. KUIJPER (*Dept. Landb. Suriname Bul.* 28, 1912, pp. 11-24, pls. 2).—As a result of the author's studies on this disease of coffee, it is stated that in Surinam it attacks both *Coffea liberica* and *C. arabica*, forming rhizomorphic strands which extend up the branches, spreading out over the under side of the leaves. The delicate hyphæ obstruct the stomata, which however they do not invade until near the death of the guard cells. Large brown spots appear on the leaves affected, which finally die and loosen, being retained however by the mycelial strands.

The fungus is said to show no fructifications, but infection with the mycelium spreads, destroying the leaves affected. The causal organism is believed to be identical with neither *Pellicularia koleroga* nor candelillo from Venezuela, but to be strictly so with the coffee blight studied by G. P. Clinton in Porto Rico following its description by F. S. Earle (E. S. R., 16, p. 144). Bordeaux mixture is recommended as a means of control of this disease.

Black canker of chestnut, G. BRIOSI and R. FARNETI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 22 (1913), I, No. 6, pp. 361-366).—The authors continue the controversy (E. S. R., 25, pp. 149, 850) as to the cause of black canker of chestnut, this being a discussion of articles by L. Petri (E. S. R., 29, p. 156). They claim that *Endothia radicalis* is almost universally a saprophytic fungus, only in exceptional cases showing limited activities as a wound parasite, and that *Coryneum* is able alone to produce black canker of chestnut.

Preliminary note on the relative prevalence of pycnospores and ascospores of the chestnut-blight fungus during the winter, F. D. HEALD and M. W. GARDNER (*Science, n. ser.*, 37 (1913), No. 963, pp. 916, 917).—In studying the dissemination of the chestnut-blight fungus during the past winter the authors obtained results which showed that pycnospores are produced in enormous numbers and washed down the diseased trees during every winter rain. A form of trap was devised by which part of the rain water falling over the cankers was collected, and the number of pycnospores obtained in the different rain periods was counted. These varied after each rain from a few thousand to several million. On the other hand, the ascospores did not appear to be washed down the tree during the winter rains, although they were present in abundance. The investigations on the ascospores indicate that there is practically no expulsion of them during the period from November 26 to March 21.

Rubber tree diseases, T. PETCH (*Trop. Agr. and Mag. Ceylon Agr. Soc.*, 39 (1912), No. 4, pp. 321-325; *abs. in Teysmannia*, 24 (1913), No. 1, pp. 60-62).—In an address on Hevea canker in Ceylon before the Kalutara Planters' Association, the author states that this disease is characterized externally by an

inconspicuous darkening of the bark, or later by an exudation of a brown rusty liquid; internally by a black layer below which the cortex is of a dirty red, soon changing to a dirty claret color. The diseased cortex has a peculiar odor which attracts boring beetles. The wood beneath is darkened by organisms which follow the canker fungus. This diseased area, producing no latex, spreads around, but more rapidly up and down the tree, which is usually girdled and killed; though cases of recovery have been noted recently, due to causes not yet determined.

The cause of Hevea canker is said to be a *Phytophthora*, which spreads chiefly by means of zoospores, resting spores forming also in the diseased tissues from which the canker has been known to spread even after partial healing of the diseased area. The fungus also attacks the pods, and may possibly spread from these to the green branches, but not down these, it is said, to the main stem. The same fungus is said to cause cacao canker, showing much the same general progress and symptoms, and it is thought to attack breadfruit, though this has not yet been proved experimentally.

Treatment involves removal and destruction of affected tissues, also of diseased fruits, and covering the wounds resulting with fungicides and protective mixtures. Bordeaux mixture sprayed on the trunks is said to prevent attacks of Hevea canker. See also previous notes (E. S. R., 17, p. 1085; 25, p. 46).

Attempts to grow mistletoe (*Viscum album*) on monocotyledons and succulent conservatory plants, E. HEINRICHER (*Anz. K. Akad. Wiss. [Vienna], Math. Naturw. Kl.*, 1912, No. 15, p. 236; *abs. in Bot. Centbl.*, 122 (1913), No. 3, pp. 44, 55).—On *Opuntia parvula*, *V. album* failed to establish itself, but a partial growth was obtained on *Cereus forbesii*, the parasite effecting entrance through the stomata and the substomatal spaces. Even in this case, however, the intruded growths remained undifferentiated and thallus-like. The reaction of these plants to invasion by mistletoe is said to resemble those set up in defense against certain poisons, varying with different plants, the ordinary hosts of mistletoe seeming to have established a tolerance for its products.

Streak, a bacterial disease of the sweet pea and clovers, T. F. MANNS and J. J. TAUBENHAUS (*Gard. Chron.*, 3. ser., 53 (1913), No. 1371, pp. 215, 216, figs. 2).—Studies on streak disease of sweet pea are said to show its identity with that observed to attack several clovers. The disease is thought to be of bacterial origin and caused by *Bacillus lathyri* n. sp. It is said to be favored by heavy dew and to be carried over in the soil, from which it may be spattered on the plants by showers or sprinkling. The only treatment recommended is such as may prevent its transmission in this manner, e. g., heavy mulching with straw. Further details are to be given in a later publication.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Distribution and migration of North American herons and their allies, W. W. COOKE (*U. S. Dept. Agr., Bur. Biol. Survey Bul.* 45, pp. 70, figs. 21).—This bulletin aims to give information as to the range of the several species, especially the breeding range, and in regard to their migration. The data presented are believed to be sufficient to form a basis for protective legislation by the States inhabited by the various species. While formerly widely distributed in the United States and very abundant in certain localities, the herons in recent years have everywhere been greatly depleted in numbers, chiefly because of the demand for their plumage for millinery purposes. Several species of egrets have, in fact, been almost exterminated.

Maps are given which show the resident, breeding, and summer occurrence of the more important species.

Bibliography of the published writings of Professor John B. Smith, compiled by J. A. GROSSBECK (*Proc. Staten Isl. Assoc. Arts and Sci.*, 4 (1911-12), No. 1-2, pp. 32-54).—This is a classified list of 546 articles, books, etc.

Remarks on some of the injurious insects of other countries, A. L. QUAINANCE (*Proc. Ent. Soc. Wash.*, 15 (1913), No. 2, pp. 54-86).—This is a general discussion of some of the more important exotic insect pests.

Insects of Labrador (In *Labrador, the Country, and the People*. New York, 1913, enl. ed., pp. 453-472, pls. 2, figs. 14).—In this article, which constitutes Appendix I to the work entitled *Labrador, the Country and the People*, by W. T. Grenfell et al., C. W. Johnson brings together information relating to the occurrence, habits, and economic importance of the insects other than beetles occurring in Labrador (pp. 453-467), and J. D. Sherman, Jr., that relating to beetles (pp. 467-472).

Miscellaneous insect pests, T. B. SYMONS and E. N. CORY (*Maryland Sta. Bul.* 175, pp. 171-180).—A brief discussion is given of some of the more important insects, together with the results of some minor experiments conducted during 1912. The insects thus dealt with are the San José scale, terrapin scale (*Lecanium nigrofasciatum*), apple aphids, woolly apple aphids, Hessian fly, fall army worm, pickle worm, locust hispa (*Chalepus dorsalis*), orange striped oak worm (*Anisota senatoria*), and house and stable flies.

A contribution to the morphology and biology of insect galls, A. COSINS (*Trans. Canad. Inst.*, 9 (1912), III, No. 22, pp. 297-387, pls. 13, figs. 9).—This work deals with the insects and galls caused by the Hemiptera, Lepidoptera, Diptera, and Hymenoptera, and by Arachnida.

The insects affecting sugar cane in Porto Rico, D. L. VAN DINE (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 251-257).—A brief résumé of the literature relating to insect enemies of sugar cane in Porto Rico is followed by a summary of all the species of insects found attacking cane during the 2 years that the author has been engaged in entomological investigations at the experiment station of the Porto Rico Sugar Producers' Association.

Notes on some Mexican sugar-cane insects from Santa Lucrecia, State of Vera Cruz, including a description of the sugar cane tingid from Mexico, F. W. URICH and O. HEIDEMANN (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 247-249, pl. 1).—These notes are based upon observations made during the months of August, September, and October, 1912, on a sugar plantation about 12 miles from Santa Lucrecia on the Coatzacoalcos River.

But one insect was observed that was the source of serious injury to cane, this being the cercopid *Tomaspsis postica*. The tingitid *Leptodictya tabida*, though damaging cane leaves, was not considered a pest. In addition to *Diatraea saccharalis*, a second cane borer, *D. grandiosella*, was found present in cane fields.

Injury of tobacco by insects, M. SCHWARTZ (*Mitt. K. Biol. Anst. Land u. Forstw.*, 1912, No. 13, pp. 77-128, figs. 57).—This is a summarized account of the insect enemies of tobacco, arranged according to the part of the plant attacked, and of preventive and remedial measures therefor.

Principal insects and diseases of the apple in Georgia, W. W. CHASE (*Ga. Bd. Ent. Bul.* 38, 1913, pp. 58, pls. 10, fig. 1).—The first part of this bulletin (pp. 7-31) deals with 7 important insects of the apple, namely, the codling moth, plum curculio, San José scale, apple woolly aphid, green apple leaf aphid, and round-headed and flat-headed apple tree borers. The second part (pp. 33-43) discusses bitter rot, apple scab, cedar rust, apple leaf spot, and apple crown gall. Notes on spraying machinery and accessories and on the care and management of apple orchards are appended.

Various insects affecting nut trees, H. A. GOSSARD (*Amer. Fruit and Nut Jour.*, 7 (1913), No. 99, pp. 4-11, 19, figs. 17).—This article is based upon the investigations previously noted (E. S. R., 17, p. 479).

Injuries following the application of petroleum or petroleum products to dormant trees, E. P. FELT (*Abstr. in Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 160, 161).—This is an abstract of a paper presented by the author before the American Association of Economic Entomologists in which attention was called to injuries following the application of miscible oils. The author believes that there is less danger of penetration by oil and consequent injury if the applications are made in the spring shortly before active growth begins.

The effects of oil insecticides on citrus trees and fruits, W. W. YOTHERS (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 161-165).—This is a report of observations made in connection with investigations carried on in Florida.

It is pointed out that the use of sulphuric acid, which was found in one brand of miscible oil to the extent of $2\frac{1}{2}$ per cent, should be avoided, as should the use of rosin or rosin oil. Attention is called to the fact that while oil sprays made without injurious chemicals and used properly cause no immediate damage and never any serious injury, they apparently interfere to a limited extent with the formation of the chlorophyll.

The success of a two-spray calendar in a Kansas orchard, H. B. HUNGERFORD (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 165-173, figs. 3).—This is a report of spraying experiments carried on in a Kansas orchard during 1912.

The destruction of the locust by its natural enemies, A. GALLARDO (*An. Mus. Nac. Buenos Aires*, 23 (1912), pp. 155-165).—A brief discussion of *Sarcophaga caridei* and *Idia fasciata* as locust parasites and of work carried on with *Coccobacillus acridorum* in combating *Schistocerca parenensis*, an account of which has been previously noted (E. S. R., 27, p. 357).

Notes on tree crickets, P. J. PARROTT and B. B. FULTON (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 177-180, figs. 15).—This article calls attention to the ovipositing habits of *Ceanthus niveus*, *O. nigricornis*, and *O. quadripunctatus*, which are the most common species in plantings of small and tree fruit in New York.

New Thysanoptera from Florida, J. R. WATSON (*Ent. News*, 24 (1913), No. 4, pp. 145-148, pl. 1).—*Cryptothrips floridensis* n. sp. is reported to have been quite numerous on the twigs of camphor seedlings (*Cinnamon camphor*) at Satsuma, Fla., in November and December, and the source of considerable damage.

The false tarnished plant bug on pears, P. J. PARROTT and H. E. HODGKISS (*New York State Sta. Circ.* 21, pp. 4, pl. 1, figs. 6).—A brief description of this pest with directions for its control in pear orchards.

Peach "stop back" and tarnished plant bug (*Lygus pratensis*), L. HASEMAN (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 237-240).—The author reports that during the past 2 years he has found the injury to peach trees in Missouri, commonly spoken of as "stop back," to be caused by the tarnished plant bug.

The apple leafhopper (*Empoasca mali*), L. HASEMAN (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 240-243).—A report of observations made in Missouri during the past 2 years.

Fall spraying for the pear psylla, H. E. HODGKISS (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 243, 244).—The author states that success attending the fall spraying of pear orchards for the psylla depends upon (1) an understanding of weather influences upon the activities of the hibernating adults; (2) the complete wetting of each tree as the work proceeds; and (3) thorough work in spraying.

The pear psylla, P. J. PARROTT and H. E. HODGKISS (*New York State Sta. Circ. 20, pp. 8, pls. 2, figs. 7*).—A brief description of this insect with directions for its control.

The cotton or melon aphid, C. E. SANBORN (*Oklahoma Sta. Bul. 98, pp. 3-20, figs. 4*).—The first part of this bulletin consists of a general description of this aphid, its life history, and injury. This is followed by a somewhat detailed account of investigations made of its predatory enemies, including lady beetles, a chrysopid, syrphus fly, etc.

Hippodamia convergens was found to deposit 556 eggs during the 34 days from April 17 to May 21. One of the larvæ, which hatched April 17, consumed a total of 396 aphids in the 11 days following. During its development it molted April 19, 21, 23, and 28, after which it pupated, this stage lasting 4 days, a total of 17 days being required for development from egg to adult lady beetle. The daily rate of reproduction of this lady beetle is about double that of the melon aphid, while the total reproduction of a single lady beetle is about 8 times greater than that of a single melon aphid.

Coccinella munda deposited 448 eggs during the 36 days following June 25, and a larva of this species consumed 553 aphids during the 9 days following June 26. The egg stage lasted 2 days, the larval period 9, and the pupal period 3 days.

A larva of *C. notata* consumed 181 aphids during the 12 days following its hatching on April 14. Four days were passed in its egg stage, 14 in its larval, and 4 days in its pupal stage.

C. sanguinea was found to deposit 251 eggs in the 24 days following July 2. *Megilla maculata* consumed 595 aphids in the 11 days following July 19. This species deposited 219 eggs in the 24 days following August 6. In August, 2 individual larvæ of this species consumed 265 and 322 aphids, respectively, in the 9 and 10 days following August 16. The amount of food consumed daily was found to decrease as cool weather approached. Another individual deposited 156 eggs in the 47 days following September 7.

Two adults of *Scymnus loewii* consumed a total of 487 aphids in the 5 days following their emergence on June 20, and 50 eggs were deposited by an individual during the 9 days following April 25. A larva of this species, which hatched from an egg on April 29, consumed 56 aphids in the following 14 days. Five days were passed in the egg stage, 14 in the larval, and 13 in the pupal stage. Two other common coccinellids, *S. terminatus* and *Eroxomus constrictus*, were found to develop in a similar period and their aphid capacity to be about the same as *S. loewii*.

The lace-wing fly *Plorabunda oculata* was found to deposit 66 eggs in 7 days following April 16. Three hundred and eighteen aphids were consumed by a larva of this species in the 12 days following hatching on April 23. The egg stage required 7 days, larval stage 12 days, and pupal stage 13 days.

Hemerobius gossypii deposited 125 eggs in the 28 days following June 7. Thirty-four aphids were consumed by the immature form in the 10 days following March 14. The egg stage required 2 days, larval stage 10 days, and pupal stage 5 days.

A larva of the syrphus fly *Bacca clavata* consumed 458 aphids in the 11 days following July 19. Two days were passed in the egg stage, 11 in the larval stage, and 5 in the pupal stage.

The author states that the nicotin product "blackleaf 40," used at the rate of 1 gal. to 900 gal. of water will control the melon louse. Applications of this insecticide should be made as soon as the aphids begin to appear in the field in

order that the infestation may be checked and the pest controlled before it scatters over the entire field.

The control of plant lice on apple trees, H. E. HODGKISS and B. B. FULTON (*New York State Sta. Circ.* 23, pp. 7, pls. 4, figs. 6).—A popular account of these pests with directions for the application of remedial measures.

The phylloxera invasion and the reconstitution of vineyards in Spain, R. J. JANINI (*Abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 12, pp. 2762-2764).—A somewhat detailed discussion of the subject.

A new California coccid infesting Manzanita (*Aulacaspis manzanitæ* n. sp.), B. B. WHITNEY (*Jour. Ent. and Zool.*, 5 (1913), No. 1, pp. 50-52, figs. 2).—This new species has been collected at several points in California, having invariably been found on Manzanita species at an elevation ranging from 1,622 to 4,701 ft. above sea level.

The disastrous occurrence of *Vanessa californica* in California and Oregon during the years 1911-12, F. M. WEBSTER (*Canad. Ent.*, 45 (1913), No. 4, pp. 117-120).—The larvæ of this butterfly are reported to have nearly destroyed the alfalfa crop at Lake View, Oreg., in July, 1911, and to have been the source of injury at other points in Oregon and in California in 1911 and 1912.

Arsenate of lead as an insecticide against the tobacco hornworms, A. C. MORGAN and D. C. PARMAN (*U. S. Dept. Agr., Bur. Ent. Circ.* 173, pp. 10).—In view of the fact that Paris green frequently burns tobacco very severely and may reduce the value of the crop as much as 50 per cent in exceptional cases, the authors recommend that arsenate of lead be used and that it be applied in dust form or powder. The dosage of arsenate of lead in powdered form varies from 3½ lbs. to 5 lbs. per acre, and when applied as a spray from 3 to 4 lbs. in 100 gal. of water. Dry wood ashes used in a bulk equal at least to the arsenate of lead are said to be the best carrier for arsenate of lead in powdered form. The application should be made with a dust gun having a fan diameter of at least 8 in., and applied when there is no breeze and when dew is on the plants.

The maize stalk borer and its control (*Sesamia fusca*), W. MOORE (*Agr. Jour. Union So. Africa*, 5 (1913), No. 3, pp. 419-428, figs. 5).—A discussion of the life history and methods of controlling the maize stalk borer, its natural enemies, etc. This insect is said to be the most serious enemy of maize in South Africa, particularly on the high veld.

Some notes on *Laphygma frugiperda* in Porto Rico, T. H. JONES (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 230-236).—This paper deals with the occurrence, life history, and enemies of, and an experimental poison bait for, the fall army worm in Porto Rico, where it is a pest of considerable importance.

It has been found at the experiment station of the Porto Rico Sugar Producers' Association to attack sugar cane, *Panicum barbinode*, corn, and onions. Three tachinid parasites (*Frontina archippivora*, *Gonia crassicornis*, and *Archytas piliventris*) have been reared from this insect at Rio Piedras. The larvæ of *Remigia repanda* are said to accompany the fall army worm. The larvæ of *L. frugiperda* prefer to work among the opening leaves of the cane, while those of *Remigia repanda* work upon the unfolded leaves, the older as well as the younger portions of the plants being eaten.

The 1912 outbreak of Alabama argillacea in Peru, C. H. T. TOWNSEND (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 244-246).—The author reports that during the first few months of 1912 the cotton-leaf caterpillar multiplied in extraordinary numbers in the cotton districts of the Peruvian coast region from 9° to nearly 12° south latitude, and more or less unusually and generally to the northward as far as Piura Department. Complete defoliation is said to have

occurred over the greater part of the districts from Chancay to Casma, reaching the latter valley on March 5.

The tachinid parasite *Eucelatoria australis* was found commonly in the fields in April.

The sugar-cane tingid from Mexico, O. HEIDEMANN (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 249-251, fig. 1).—The author presents a description of *Leptodictya tabida*.

Itonida anthici n. sp., E. P. FELT (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 278, 279).—This gall fly is said to produce clusters of pinkish white, flowerlike galls on cypress, *Taxodium distichum*, in Arkansas, Mississippi, and Alabama. It is stated that the galls are sometimes so numerous as to dominate the dark green cypress foliage and give the appearance of an ordinary flowering plant thickly set with small blossoms.

Notes on the wheat fly (*Contarinia tritici*), with special reference to its depredations in central Sweden during the summer of 1912, E. HENNING (*Sveriges Utsädesför. Tidskr.*, 23 (1913), No. 1, pp. 65-81, figs. 16).—Data showing the localization of the larvæ of the insect in the wheat head and the percentage of affected plants of different varieties at Ultuna and other places in central Sweden are presented. Possible preventive measures are also discussed in the paper.

Bleeding trees, E. P. FELT (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 285, 286).—Numerous larvæ, superficially resembling *Sciara* but probably referable to the genus *Ceratopogon*, were found in sap originating from a crevice in the trunk of a sugar maple at Kinderhook, N. Y. The point below the injury was brown, corrugated, and seemed to be covered with precipitates from the sap. An examination of the cavity showed the larvæ to be present in the deepest portion of the crevice, where they apparently kept the tissues in a constant state of irritation. The sap issuing from a similar wound on a horse chestnut trunk was inhabited by probably identical larvæ.

Pellagra and the sand-fly, II, S. J. HUNTER (*Jour. Econ. Ent.*, 6 (1913), No. 1, pp. 96-101).—This is a report of the work carried on in Kansas in 1912 in continuation of that previously noted (*E. S. R.*, 26, p. 656).

The mosquitoes of North and Central America and the West Indies, L. O. HOWARD, H. G. DYAR, and F. KNAB (*Carnegie Inst. Washington Pub.* 159, 1912, vols. 1, pp. VII+520, pls. 14, figs. 6; 2, pp. X, pls. 150).—This work is based on investigations commenced in January, 1903. The first volume deals with early accounts of mosquitoes; the structure and habits of adults, larvæ, and pupæ; natural enemies; collecting, mounting, and rearing; the relation of mosquitoes to man; economic loss from mosquitoes; examples of mosquito control; a bibliography; and an index.

The second volume consists of plates illustrating the morphology of mosquitoes as dealt with in volume 1.

Preliminary note on the finding of *Hypoderma bovis* at Agassiz, B. C., together with notes on the biology of the fly, S. HADWEN (*Proc. Brit. Columbia Ent. Soc.*, 1912, pp. 81, 82; *abs. in Rev. Appl. Ent.*, 1 (1913), *Ser. B*, pt. 3, p. 60).—The author reports that during the summer of 1912, 6 specimens of *H. bovis* were captured while attacking cattle and 7 flies bred from their puparia. This is said to be the first record of the occurrence of the species in Canada and probably for North America.

On the influence of the metamorphosis of *Musca domestica* upon bacteria administered in the larval stage, H. TEBBUTT (*Jour. Hyg. [Cambridge]*, 12 (1912), No. 4, pp. 516-526).—"Pathogenic organisms such as *Bacillus dysenteriae* (type 'Y') can not be recovered from pupæ or imagines reared from

larvæ to which these organisms have been administered. When the larvæ have been bred from disinfected ova and are subsequently fed on *B. dysenteriae* (type 'Y'), this organism may be successfully recovered from the pupæ and imagines in a small proportion of cases. Under similar conditions *B. typhosus* was not recovered in a single case from pupæ or imagines. In those cases in which *B. dysenteriae* (Y) was successfully recovered from pupæ, the colonies on the plate were invariably fewer than those obtained from pupæ and imagines after administration to the larvæ of more adaptable organisms such as 'Bacillus A' (Ledingham). When organisms such as 'Bacillus A' were administered to larvæ bred from disinfected ova, or nondisinfected ova contaminated with this organism, it was in many cases possible to recover the organism from pupæ and imagines. In no series of pupæ examined after administration to the larvæ of either *B. dysenteriae* or 'Bacillus A' was it possible to recover the organisms in every instance. A certain proportion of pupæ in both cases proved sterile, so that the process of metamorphosis is undoubtedly accompanied by a considerable destruction of the bacteria present in the larval stage.

"The temperature at which the larvæ develop (19-25° C.) has probably an important bearing on the survival of pathogenic organisms such as 'Bacillus Y' of dysentery, administered in association with organisms such as 'Bacillus A,' in view of the fact that the latter grows far more luxuriantly at this temperature. Even when grown in broth at 37° (the optimum temperature for *Bacillus Y*) together with 'Bacillus A,' the 'Bacillus Y' was found to form after 2 days only one quarter of the total number of bacteria present in the mixed growth. There was no evidence that the larval juices contained substances bactericidal for *Bacillus Y*. The bacilli died more rapidly in normal saline solution. The possibility of flies becoming infected from the presence of pathogenic organisms in the breeding ground of the larvæ may be considered as very remote."

The relation of the stable fly (*Stomoxys calcitrans*) to the transmission of infantile paralysis, C. T. BRUES (*Jour. Econ. Ent.*, 6 (1913), No. 1, pp. 101-110).—This is a review of recent work on the subject.

Tachinidæ and some Canadian hosts, J. D. TOTHILL (*Canad. Ent.*, 45 (1913), No. 3, pp. 69-75).—The author records the rearing of Tachinidæ (36 species) from 39 hosts not previously recorded.

Muscoid parasites of the cotton-stainer and other lygæids, C. H. T. TOWNSEND (*Psyche*, 20 (1913), No. 2, pp. 91-94).—The author records the rearing in Peru of *Xanthomelanodes peruanus* from *Stenomacra* sp. and *Acaulona peruviana* n. sp. from *Dysdercus ruficollis*.

Inquiry into the relationships and taxonomy of the muscoid flies, C. H. T. TOWNSEND (*Canad. Ent.*, 45 (1913), No. 2, pp. 37-57).—A somewhat detailed discussion of the subject.

A synopsis of the Sapromyzidæ, A. L. MELANDER (*Psyche*, 20 (1913), No. 2, pp. 57-82, pl. 1).—This review is based upon studies of 80 species of the family. Working tables for the separation of both genera and species are included.

The Coleoptera of the British Islands, W. W. FOWLER and H. St. J. DONISTHORPE (*London, 1913, vol. 6, pp. XIII+351, pls. 23*).—This is a supplement to a work, the fifth and concluding volume of which was published in 1891.^a

The first part (pp. 1-200) of this supplement consists of a discussion of species not included in the previous volume. This is followed by a list of additional localities, notes, etc. (pp. 201-319). The myrmecophilous Coleoptera of Great Britain are discussed in a paper by H. St. J. Donisthorpe (pp. 320-330). The addenda include various miscellaneous data.

^a The Coleoptera of the British Islands, C. Fowler (London, 1891, vol. 5, pp. XXVIII + 490, pls. 38).

The life cycle of *Lachnosterna tristis*, J. J. DAVIS (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 276-278).—It is stated that up to the present time the life cycle of but one species of *Lachnosterna* (*L. arcuata*) has been worked out and recorded in literature. This was studied by Pergande (E. S. R., 11, p. 365) who found it to have a life cycle of practically 3 years, at Washington, D. C., it remaining in the grub stage parts of 3 years, and the total larval period being slightly over 25 months. *L. tristis* has been found by the author to have a life cycle of only 2 years.

Some experiments with Roentgen rays upon the cigarette beetle, *Lasioderma serricorne*, A. C. MORGAN and G. A. RUNNER (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 226-230).—This is a report of tests made of an X-ray machine built for sterilizing cigars upon a commercial scale. The results show that neither the "hard" nor the "soft" rays used in the test gave any indications of affecting any of the stages of the cigarette beetle.

An enemy of the cigarette beetle, A. C. MORGAN (*Proc. Ent. Soc. Wash.*, 15 (1913), No. 2, p. 89).—The larvæ of the clerid beetle *Thaenoclerus girodi* have been found by the author to prey upon the larvæ and pupæ of *Lasioderma serricorne* at Key West, Fla.; the adults are predaceous upon all stages of this pest.

Phytonomus meles, E. P. FELT (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 283, 284).—This weevil appears to have been recently introduced into this country, it having been first collected in New York State in 1907. It was reared from clover collected in the vicinity of Albany in 1908, and was observed during the latter part of May, 1912, to be very abundant on red clover at New Baltimore, N. Y., feeding upon the foliage and causing some injury.

The Siricidæ of North America, J. C. BRADLEY (*Jour. Ent. and Zool.*, 5 (1913), No. 1, pp. 1-30, pls. 5).—This is a brief preliminary account of the horn-tails.

New Ichneumonoidæ parasitic on leaf-mining Diptera, A. B. GAHAN (*Canad. Ent.*, 45 (1913), No. 5, pp. 145-154).—*Opius utahensis*, reared from *Agromyza parvicornis* at Salt Lake, Utah; *O. suturalis* and *O. aridis*, both reared from *A. pusilla*, at Tempe, Ariz.; *O. bruncipes*, reared from *A. pusilla*, at Lakeland, Fla.; *O. succineus*, reared from *Agromyza* sp., mining leaves of *Panicum*, at Lafayette, Ind.; *Dacnusa scaptomyza*, reared from *Scaptomyza flaveola*, at College Park, Md.; and *D. agromyza*, reared from *A. angulata*, at Lafayette, Ind., are described as new to science.

A new genus and one new species of Chalcidoidea, A. B. GAHAN (*Canad. Ent.*, 45 (1913), No. 6, pp. 178-182).—*Coelopisthoidea cladiæ* n. g. and n. sp. was reared at Upper Marlboro, Md., from the cocoons of the sawfly *Cladius pectinicornis* occurring on rose bushes.

Scutellista cyanea, bred from *Phenacoccus artemisiæ*, E. O. ESSIG (*Jour. Ent. and Zool.*, 5 (1913), No. 1, pp. 55).—This is said to be the first record of the rearing of *S. cyanea* from this type of coccid.

An undescribed hymenopterous parasite of the house fly, C. H. RICHARDSON, Jr. (*Psyche*, 20 (1913), No. 1, pp. 38, 39, pl. 1).—A new pteromalid, reared from *Musca domestica* at Forest Hills, Mass., and from *Stomoxys calcitrans* at Dallas, Tex., is described under the name of *Spalangia muscidarum*.

New Peruvian parasites from *Hemichionaspis minor*, E. W. RUST (*Ent. News*, 24 (1913), No. 4, pp. 160-165).—*Prospaltella peruviana*, reared from *H. minor*; *Signiphora lutea*, reared from *H. minor* and *Pseudonidia* sp. on various hosts, principally cotton and citrus; and *Neosigniphora nigra*, reared from *H. minor* on cotton, are described as new to science.

Additional notes on the biology of the Rocky Mountain spotted fever tick, F. C. BISHOPP and W. V. KING (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 200-211).—The notes here presented are supplementary to the accounts previously

noted (E. S. R., 26, p. 254; 27, p. 865). They deal with seasonal activity of adults, distribution and hosts, hibernation, life history, etc.

The red spider on cotton (*Tetranychus bimaculatus*), E. A. MCGREGOR (*U. S. Dept. Agr., Bur. Ent. Circ. 172, pp. 22, figs. 12*).—This revision of Circular 150, previously noted (E. S. R., 27, p. 264) is based upon work at Batesburg, S. C., in 1911 and 1912.

Odontopharynx longicaudata n. g., n. sp.—A new form of Anguillulidæ. J. G. DE MAN (*Zool. Jahrb., Abt. System. Geogr. u. Biol. Tiere, 33 (1912), No. 6, pp. 637-642, pl. 1*).—This nematode was taken from diseased hyacinth bulbs in Holland.

An introduction to the study of the Protozoa with special reference to the parasitic forms, E. A. MINCHIN (*London, 1912, pp. XI+520, figs. 193*).—This work is intended to serve as an introduction to the subject with which it deals.

FOODS—HUMAN NUTRITION.

The hygiene of diet and the chemical properties of foods, AMÉLIE DES-ROCHES (*Hygiène de l'Alimentation et Propriétés Chimiques des Aliments. Neurville, France, 1912, 1. ed., pp. XIX+490, figs. 84*).—The chemical properties of foods, diet in different diseases, and similar questions are discussed, and cooking processes are described. Each chapter is followed by a list of questions, the volume being designed as a text-book.

International review of the literature of food, its composition, analysis, and adulteration, for the year 1910, A. J. J. VANDEVELDE (*Répert. Internat. Comp., Anal. et Falsif. Denrées Aliment., 11 (1910), pp. 127*).—An indexed and annotated bibliography, continuing previous work (E. S. R., 27, p. 206).

Boiled versus raw milk—an experimental study of milk coagulation in the stomach, together with clinical observations on the use of raw and boiled milk, J. BRENNEMANN (*Jour. Amer. Med. Assoc., 60 (1913), No. 8, pp. 575-582, figs. 8*).—Experiments were carried out to investigate the coagulation of raw milk and milk which had been boiled for 5 minutes, the subject of the experiments being a healthy young man of normal digestion who was able to empty the stomach without discomfort, by passing the finger into the throat.

Milk was taken at a temperature of 95° F., and after remaining in the stomach for periods varying in different experiments from 30 minutes to 5 hours was returned for examination. It was found that the raw milk formed large, dense, hard curds with complete separation from the whey, while in the case of the boiled milk there was less separation and the curds were soft and fine.

Laboratory experiments in which rennin was added to both raw and boiled milk gave similar results. The results obtained with pasteurized milk were between those of raw and boiled milk, but more similar to the former. When raw milk was sipped very slowly the curds formed were larger than when the milk was taken more rapidly; this was apparently due to the coalescence of the smaller curds which were formed at first into one or more large curds, as was shown by the slow addition of a quantity of milk to a rennin solution. Raw milk was found to remain in the stomach longer than boiled milk, since it was possible to recover curds from the former after longer periods than in the case of the latter. Similar experiments were made with various modified milks (e. g., milks diluted with water and cereal water, citrated milks, milk and lime water, and condensed milks) which showed that the modification had much the same effect as boiling, since the curds formed were soft and fine.

From these experiments and a large amount of clinical data regarding the results of feeding children upon raw and boiled milk, the author concludes that raw and boiled milk are clinically very different foods, and that unless modified

so that it will not form hard curds the casein of raw milk offers serious digestive difficulties that are not present in boiled milk.

Investigation and judgment of anchovy butter, A. BEHRE and K. FRERICHS (*Ztschr. Untersuch. Nahr. u. Genussmittel*, 24 (1912), No. 11, pp. 676-682).—Analyses of true anchovy butter and a similar butter made from herrings show the former to have a lower fat content and lower values for the iodine number and refractive index of the extracted fat.

Anchovy butter containing less than 10 per cent fat, as a rule, may be regarded as containing no other fish than anchovies. In mixtures made of equal parts of butter and fish it is impossible to detect the presence of foreign fish.

Oysters and how to cook them (*New York*, pp. 24, figs. 24).—This recently published pamphlet contains a large number of recipes for preparing oysters and a number of menus in which oyster dishes are prominent features.

The story of a loaf of bread, T. B. WOOD (*Cambridge and New York*, 1913, pp. VI+140, figs. 17).—Wheat growing and marketing, milling, baking, the composition of bread, the relative value of different kinds of bread, and similar topics are discussed in this popular summary.

Bermuda arrowroot (*Bul. Imp. Inst. [So. Kensington]*, 10 (1912), No. 4, pp. 566-569).—Only 2 of 5 samples of so-called Bermuda arrowroot purchased in London responded to tests characteristic of genuine samples.

"The differences shown by the test probably depend on differences in the mode of preparation of the arrowroot in the countries of origin. Further experience is therefore necessary in order to determine whether the test is of permanent value."

Arrowroot from the Gold Coast (*Bul. Imp. Inst. [So. Kensington]*, 10 (1912), No. 4, p. 569).—The examination of a sample is reported.

Tapioca (cassava) flour and starch (*Bul. Imp. Inst. [So. Kensington]*, 10 (1912), No. 4, pp. 562-565).—Samples of tapioca of different origin were examined.

Recipes for the preparation of the dasheen, R. A. YOUNG (*U. S. Dept. Agr., Bur. Plant Indus. Circ.* 127, pp. 34-36).—Recipes are given for cooking dasheen in a variety of ways.

As the author points out, "this vegetable is a staple article of food for millions of people in tropical and subtropical countries. In general it is used in the different ways in which the white potato is used. It may also be candied like the sweet potato. The flesh of the corms and large tubers is frequently somewhat gray or violet when cooked, but this does not affect the flavor.

"When uncooked dasheens are being scraped or pared they should be handled in water to which a teaspoonful of sal soda to the quart has been added, in order to prevent irritation to the hands."

Dried bananas (*Lancet [London]*, 1913, I, No. 1, p. 44).—An analysis is reported of a sample of dried bananas.

Cocoa from the Gold Coast (*Bul. Imp. Inst. [So. Kensington]*, 10 (1912), No. 4, pp. 556-561).—Descriptive and analytical data are included in this report of the examination of 4 samples of cocoa.

Bottled pickles, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul.* 249, 1913, pp. 11).—The results of the inspection of 80 samples are reported.

Studies of the origin of the caffeols, V. GRAFE (*Monatsh. Chem.*, 33 (1912), No. 10, pp. 1389-1406).—The formation of the aromatic substances during the roasting process was studied in the case of ordinary coffee and "caffeine-free" coffee.

Concerning a number of foodstuffs of local origin, ADLUNG (*Tropenpflanzer*, 17 (1913), No. 4, pp. 171-181, figs. 4).—Descriptive and analytical data are given

regarding "dschamma" (*Citrullus vulgaris*), the bulbs of *Cyperus edulis*, the seeds of a legume (*Bauhinia esculenta*), and a flour made apparently from manioc root.

Food and [other analyses], R. E. ROSE and A. M. HENRY (*Fla. Quart. Bul. Agr. Dept.*, 23 (1913), No. 2, pp. 124-127).—Analyses of grape fruit, sugar cane, and beverages are reported.

Annual report of the food and drug commissioner to the governor of the State of Missouri, 1912, W. P. CUTLER (*Ann. Rpt. Food and Drug. Comr. Missouri*, 1912, pp. 104).—A summary of the inspection, sanitary, and educational work carried on.

Of 1,032 samples of miscellaneous foods and drugs examined, 468 were not passed.

Prices, price indexes, and cost of living in Australia, G. H. KNIBBS (*Commonwealth Bur. Census and Statis. Aust., Labor and Indus. Branch Rpt. I*, 1912, pp. 96+LXII, figs. 18).—This report gives considerable data showing the variations in prices of the principal food materials during the last 10 years in Australia, and a comparison with the prices in other countries.

Report of commission on the cost of living in New Zealand, together with minutes of proceedings and evidence (*Wellington: Govt.*, 1912, pp. CXXXVI+510).—An exhaustive summary and discussion of data. Such topics are included as the effect of standards of living, the distribution of population, and monopolies.

Illinois farmers' institute department of household science, edited by MRS. H. A. McKEENE (*Ill. Farmers' Inst., Dept. Household Sci. Year Book 1912*, pp. 252, figs. 27).—In addition to the proceedings, reports, and similar data, the volume contains a number of addresses and miscellaneous papers, including among others the following: Building the Home, by Mrs. J. C. Hessler; Educating Girls for the Home, by Villa M. Sprague; Household Economics, by Mrs. A. P. Norton; Household Appliances and Conveniences, by Mrs. L. M. Cutting; A Balanced Ration, by Mrs. E. F. Ford; The Dress Question, by Mrs. L. Stevenson; The Social Efficiency of the Home, by Bertha Miller; How School Work can be More Closely Related to Home Needs, by Miriam Besley; A Simple Classification of Foods, by Mrs. H. M. Dunlap; The Nutritive Ratio of Food, by Mrs. H. A. McKeene; and Training the Girl to Help in the Home, by W. A. McKeever.

A number of menu suggestions are presented, and a study of food values published by the Illinois State Food Commission (*E. S. R.*, 28, p. 762) is reprinted.

The universal cook book, HELEN CRAMP (*Philadelphia*, 1913, pp. IV+507, pls. 32, figs. 8).—In addition to a large collection of recipes, there are chapters on paper bag, casserole, fireless, and chafing dish cookery, and on meat substitutes.

A model French kitchen, J. B. OSBORNE (*Daily Cons. and Trade Rpts. [U. S.]*, 16 (1913), No. 105, pp. 641, 642).—The character and cost of equipment and similar data are considered.

Some kitchen experiments with aluminium (*Lancet [London]*, 1913, I, No. 1, pp. 54, 55).—Tests are reported in which salt and water, acetic acid and water with and without salt, tartaric acid with or without salt, carbonate of soda, and onions, carrots, Brussels sprouts, apples, and soup were boiled in aluminum saucepans, and bacon, beefsteak, and tomatoes with butter, salt, and pepper were fried in an aluminum pan.

The addition of a little carbonate of soda in the cooking of Brussels sprouts, in accordance with a culinary system, resulted in the presence of small quantities of aluminum in the water in which the vegetable was boiled.

"The experiments on the whole show no serious count against aluminum. This metal, at all events, does not appear to me more susceptible to the action of water and foods in the process of cooking than does iron, which has been used from time immemorial as the material of cooking pans. . . . There is no evidence to show that in the ordinary cooking operations of everyday practice either iron or aluminum is so strongly attacked as to produce an objectionable amount of soluble salts. All that can be found, when even organic acids and mineral salts are present in the cooking pan, are the merest traces of metal in a soluble state. The alumina precipitated by ammonia in the tests was in practically all cases an unweighable quantity. The case is different when an alkali is present. Carbonate of soda, for example, is without action upon iron, but it certainly attacks aluminum freely, and it would be well to exclude that salt from an aluminum cooking utensil, although even in this case it is doubtful whether any injury to health would be done. The makers of aluminum cooking vessels are fully aware of this action, and, as has been said, they commonly issue a notice warning the possessors of aluminum vessels not to use carbonate of soda, which, after all, is not indispensable to cooking processes."

The opinion is expressed that in general aluminum as now made by reputable manufacturers is to be regarded as "a suitable material for cooking vessels, and . . . any suspicion that it may communicate poisonous qualities to food in the process of cooking may safely be dismissed in view of the results of the practical experiments which we have recorded, showing that the metal is not appreciably acted upon in cooking operations."

The experiments were made in the Lancet laboratory.

Culinary and chemical experiments with aluminium cooking vessels, J. GLAISTER and A. ALLISON (*Lancet* [London], 1913, I, No. 12, p. 853).—A summary of a paper by the authors is presented dealing with the effects on the metal of cooking such foods as bacon, drippings, milk, orange and lemon marmalade, Brussels sprouts, and tomato sauce, in the usual culinary manner, and laboratory tests with such substances as solutions of common salt, acetic acid, sodium bicarbonate, and a mixture of salt, tartaric, and citric acids with water of different sorts.

In the case of bacon, drippings, and milk, no aluminum was dissolved, but with the orange and the lemon marmalade, Brussels sprouts, and tomatoes, small amounts were found in solution. In the test with sodium bicarbonate, minute traces of soluble aluminum were found, but not with the other substances enumerated. The largest amount of aluminum, 1,018 grains of aluminum hydroxid, was found with the orange and lemon marmalade, but the authors believe that the amount would prove harmless even if eaten at one meal by one person. "In the cooking experiments no aluminum chlorid was found, and the amount of hydroxid found would, if converted into the chlorid in the stomach, still fall far short of the medicinal dose of the salts. In view of the results obtained the authors feel justified in declaring that the ordinary use of aluminum cooking vessels for culinary purposes is not attended by any risk to the health of the consumers of food cooked therein."

Our children's health at home and at school, edited by C. E. HECHT (*Westminster, England*, 1912, pp. 5+467).—This book, which reports a conference held at Guildhall, London, May 13, 1912, on diet and hygiene in public, secondary, and private schools, contains the report of proceedings and an account of exhibits shown at the conference, which consisted largely of bills of fare, and the comments of the press on the conference.

The papers presented included, among others, the following: Diet as a Factor in Physical, Intellectual, and Moral Efficiency, by C. Dukes; Diet in Boarding

Schools, by Miss M. E. Robertson; The Importance of Adequate Meals and Suitable Dietary in Securing Efficiency and Good Scholarship, by A. A. Mumford; Main Lines of Reform in Feeding at Public, Secondary, and Private Schools, by J. Sim Wallace; The Teaching of Elementary Physiology and Personal Hygiene in Public, Secondary, and Private Schools (with an outline syllabus), by Mrs. A. M. Burn; The Teaching of Health (Personal and Social), by C. Reddie; Problems in Institutional Feeding, by Mrs. S. Hazell; and Training in Institutional Work, by Marie Michaelis.

In the paper referred to above Dr. Sim Wallace discusses chiefly foods in relation to dental decay and similar topics. With this in mind he divides foods into two classes, namely, "those which tend to cling about the teeth and give rise to oral malhygiene, and those which, on the other hand, are cleansing in their nature, thus giving rise to a hygienic state of the mouth and teeth." According to his classification, noncleansing foods include farinaceous and sugary foods in general without fibrous elements (as cakes, bread and jam, milk, puddings, preserved fruits, and sweets, and such liquids as cocoa and chocolate), while the cleansing foods include fibrous food generally (fish, meat, bacon, raw vegetables and in lesser degree cooked vegetables, stale bread, crust, toasted bread, pulled bread, cheese, and so on, fresh fruits requiring mastication such as apples, fatty foods such as butter, and such liquids as tea, coffee, water, soups, and beef tea.

He believes that "children should always have a considerable amount of the farinaceous food in a form which will stimulate a pleasurable amount of efficient mastication, and thus promote the normal growth of the jaws and a regular arrangement of the teeth. The albuminous part of their diet should also be presented in a form which will encourage mastication, e. g., boiled fish, meat, and bacon. Milk or milk substitutes should only be allowed in small amounts.

"The meals should be arranged in such a way that if soft, starchy, or sugary food has been eaten, the mouth and teeth will be cleansed by food of a detergent nature taken immediately after. Thus, therefore, when sweets of any kind, e. g., milk puddings, jam rolls, cake, sweet biscuits, bread and marmalade or jam are eaten, fresh fruit should be eaten afterwards.

"Three meals daily are to be preferred to any greater number, as the longer the interval the more hygienic is the state of the mouth and stomach, and more perfectly prepared for the reception of a further meal. Sweets, chocolate, or biscuit and milk should never be eaten between meals or before going to bed. . . .

"From certain physiological considerations it is obvious that some foods of a cleansing nature are not suitable for the termination of a meal. We are practically limited to savories, to pulled bread with cheese and celery, followed by water or some more refreshing drink, preferably slightly acid and aromatic, or to fresh fruit."

The nutrition coefficient of Antwerp school children, M. C. SCHUYTEN (*Paedol. Jaarboek*, 8 (1912-13), p. 13; *Bul. Soc. Chim. Belg.*, 26 (1912), No. 11, pp. 503, 504).—The author considers that Oppenheimer's formula for determining the nutrition coefficient is theoretically correct and that it gives a good idea of the general condition of nutrition.

Nutrition depends upon the kind of food ingested and the degree of assimilation. The author studied the effect of attendance at school on this coefficient, with children from 3 to 15 years of age, and concluded that the coefficient decreased until the age of 7 years and then became either irregular or stationary.

Notes regarding the diet of the laborer and the mechanic. R. OTLET (*Prog. Agr. y Pecuário*, 19 (1913), No. 809, pp. 119, 120).—The relative cost and nutritive value of different articles of food in Spain, with suggestions for the substitution of the more economical for the more costly food materials in the diet, are given.

The utilization of ammonia in the protein metabolism, A. E. TAYLOR and A. I. RINGER (*Jour. Biol. Chem.*, 14 (1913), No. 4, pp. 407-418, fig. 1).—When ammonium carbonate was given per os to dogs a considerable part of the nitrogen was retained and failed to be eliminated in the after-period. When given subcutaneously it was promptly eliminated.

The administration of urea was followed by complete elimination of all the nitrogen. When ammonia was given to man on a protein-free diet (0.065 gm. per day) about two-thirds was retained.

Studies in the purin metabolism.—I, On uricolysis in the human subject, A. E. TAYLOR and W. C. ROSE (*Jour. Biol. Chem.*, 14 (1913), No. 4, pp. 419-422).—From the figures presented, it is clear, according to the authors, "that although the replacement of milk-egg nitrogen by sweetbread nitrogen results in a rise in the purin nitrogen of the urine, an expression of the elimination of purins derived from the catabolism of the nucleic acids of the sweetbreads, this increment in elimination is less than half of the known input of purin in the state of nucleic acids in the sweetbreads. . . . It is clear from these figures that the larger portion of the ingested purin was either destroyed in the alimentary tract prior to resorption, or was converted in the metabolism into nonpurin (presumably into urea), since less than half of the ingested amount was recovered in the urine. It is also clear from the figures that the ingestion of a moderate amount of purin bases does not lead to increase in the purin bases in the urine, but solely to increase in uric acid."

Further experiments on the indispensability of lipoids for life—the destruction by heat of lipoids in the food which are essential for life, W. STEPP (*Ztschr. Biol.*, 59 (1912), No. 8, pp. 366-395).—The property possessed by the alcohol-ether extracts of certain substances, as egg yolk, calf brain, etc., of rendering an inadequate diet sufficient to sustain animals, is destroyed by boiling with alcohol for 2 days, or heating with water for the same time.

The lipoids present in natural foods are destroyed by boiling. A diet sufficient to maintain a mouse was changed by boiling for 2 days with alcohol to such an extent that all the animals fed on it died. This effect of heating was overcome by the addition of lipoids obtained in the absence of higher temperatures, showing that the change produced by heating the diet involved a destruction of certain lipoids essential to life. The heating process evidently must be carried out for a certain minimum time, for heating with water for 6 hours had no effect on the foods. This experiment would indicate that the animal organism in this case was unable to synthesize the essential lipoids from their fundamental structural parts or "building stones."

Relationship of gastric to pancreatic fat digestion in infants, J. P. SEDGWICK and F. W. SCHULTZ (*Amer. Jour. Diseases Children*, 2 (1911), No. 2, pp. 243-247).—A lipase was found in the gastric secretion of infants. The function of this lipase continued after the gastric contents had left the stomach and were neutralized in the duodenum.

Relation of meat ingestion to indicanuria in children, E. C. FLEISHNER (*Amer. Jour. Diseases Children*, 2 (1911), No. 2, pp. 262-266).—Children aged 6, 9, and 12 years, when given an ordinary diet containing meat once daily, digested their food fairly well and without much intestinal putrefaction, but

3-year old children were apt to show indicanuria on such diets. Meat given twice daily produced no change in the amount of intestinal putrefaction in the case of 9 and 12-year old children, but gave rise to increased indicanuria and pronounced intestinal putrefaction with children from 3 to 6 years old.

The conclusion is drawn from these experiments that the giving of meat to children under 9 years of age oftener than once daily is conducive to intestinal putrefaction, and indicanuria is to be deprecated on account of the harm resulting from the abnormal products of intestinal putrefaction.

The rôle of mineral salts in the metabolism of infants, B. R. HOOBLER (*Amer. Jour. Diseases Children*, 2 (1911), No. 2, pp. 107-141).—This article discusses the mineral salt content of mother's and cow's milk and their ingestion, absorption, and elimination by infants.

There are differences in the salts of mother's and cow's milk which should be considered in artificial feeding. The various salts, except iron, are present in the proper proportions and sufficient quantities in mother's milk, but most dilutions of cow's milk contain an excess of mineral salts which, although negligible in the feeding of normal infants, play an important part in the feeding of children already suffering from nutritional disturbances.

Salts are best absorbed and utilized when in organic combination with food-stuffs. In certain pathological conditions some salts are not absorbed by the organism, even though they may be present in abundance in the food, while in other conditions they are actually withdrawn from the body to such an extent as to produce serious nutritional disturbances.

Nutrient salts—the determination of the ash constituents of foodstuffs, R. BERG (*Chem. Ztg.*, 36 (1912), Nos. 55, pp. 509-511; 56, pp. 523, 524; *abs. in Hyg. Rundschau*, 23 (1913), No. 8, pp. 472, 473).—The author discusses the importance of mineral matter in food and reports methods for the determination of the individual ash constituents of food materials of different character.

The mode of behavior of the purin bases of muscles during fatigue, V. SCAFFIDI (*Arch. Ital. Biol.*, 58 (1912), No. 3, pp. 337-341).—The results of several experiments showed that the total amount of the purin bases present in a frog's leg muscle which had been stimulated to the point of fatigue was from 9 to 17 per cent less than the amount present in the muscle of the other leg of the same animal which had been kept at rest and analyzed as a control.

This decrease was due to a diminution of the fixed bases as the amount of free purin bases in the fatigued muscle remained the same as in the muscle at rest. No uric acid was found in the fatigued muscles, from which the author concludes that either uric acid is not formed or is broken down as soon as formed by a very active uricolytic ferment present in the muscles.

The content of purin bases in the different kinds of muscular tissues, V. SCAFFIDI (*Arch. Ital. Biol.*, 58 (1912), No. 3, pp. 342-346).—Smooth muscle was found to contain about half as much of purin bases as striated and heart muscle from the same animal, while the heart muscle contained slightly larger amounts than the striated muscle.

ANIMAL PRODUCTION.

By-product feeds, H. J. PATTERSON and H. J. WHITE (*Maryland Sta. Bul.* 168, pp. 27).—This bulletin is a supplement to work previously noted (E. S. R., 19, p. 363), and reports analyses and coefficients of digestibility of various weed seeds, screenings, and by-product feeds, with data as to the vitality of seeds in grain screenings. The average coefficients of digestibility of by-product feeds obtained in experiments with 2 steers are summarized in the following table:

Average coefficients of digestibility of some by-product feeds.

Kind of feed.	Dry substance.	Crude protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>
Flax plant by-product.....	50.52	63.43	74.95	42.97	48.32	50.85
Flax plant by-product and molasses.....	54.89	62.50	59.72	62.63	31.84	59.71
Ground grain screenings.....	58.85	65.47	63.59	80.59	17.48	30.59
Buckwheat middlings.....	72.94	90.76	73.65	90.77	30.89	20.46
Rye-distillers' grains.....	37.78	43.19	70.35	46.81	22.28	.....
Oat hulls.....	54.10	50.10	76.70	52.70	59.90	.....

A germination test of unground grain screenings after digestion showed that more weed seeds were destroyed by passing through the digestive tract of a cow than of a horse.

Maintenance tests with a pig, mule, and bull were also made of oat hulls.

Silver beet feeding tests at Belfast freezing works, A. MACPHERSON (*Jour. Agr. [New Zcal.]*, 6 (1913), No. 2, p. 165).—From experiments in foraging sheep on silver beets at intervals during a season of 10 months, it was concluded that the carrying capacity per acre was 8.28 sheep for 70 days. The crop was greedily eaten and the sheep thrived upon it.

Value of sugar beet tops, BACHELIER (*Sucr. Indig. et Colon.*, 81 (1913), No. 21, pp. 488, 489).—Sugar beet tops and pulp when fed as silage were found to be very palatable, nourishing, and comparatively cheap. Analyses of the tops and pulp are given showing a high percentage of carbohydrates.

Chemical analyses of licensed commercial feeding stuffs, F. W. WOLL (*Wisconsin Sta. Circ. Inform.* 42, pp. 110).—A report of the feeding stuffs control for the year, including analyses of 1,019 samples of commercial feeding stuffs, including oil meal, cotton-seed meal, cotton-seed cake, gluten feed, distillers' grains, hominy feeds, wheat bran, middlings, red dog flour, germ middlings, rye, barley, and buckwheat feeds, ground corn and oats, dried brewer's grains, malt sprouts, ground bone, meat scrap, blood meal, tankage, degerminated corn, oats, rye, bean meal, soy beans, screenings, chess seed, corn silage, beet-leaf silage, beet-top silage, rutabaga silage, alfalfa meal, and proprietary mixed feeds.

Commercial feeding stuffs and fertilizers licensed for sale in Wisconsin, 1913, F. W. WOLL (*Wisconsin Sta. Circ. Inform.* 43, pp. 14).—This gives lists of manufacturers of concentrated commercial feeding stuffs and fertilizers and their brands as licensed for 1913.

Feeding stuff control, L. HILTNER ET AL. (*Landw. Jahrb. Bayern*, 2 (1912), No. 9, pp. 607-676).—Analyses are reported of flax meal, rice meal, rye bran, barley, oats and corn products, cotton-seed meal, coconut meal, palm cake, alfalfa meal, fish meal, and other products.

Feeds, and how to judge them by the guaranteed analysis, J. H. PAGE and R. M. HUTCHINS (*Bur. Mines, Manfrs. and Agr. [Ark.]*, Bul. 3, 1913, pp. 14).—The various feeding stuffs are defined and their guaranteed analyses considered.

Feeding experiments, GERLACH (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg*, 5 (1912), No. 1, pp. 18, 19).—In tests to determine the relative value of protein for growth, 25 pigs were fed a ration of potatoes, meat meal, rape, and barley. Lot 1 received 4 kg. and lot 2, 3 kg. of digestible protein per day per 1,000 kg. live weight, and the average daily gains were 0.519 kg. and 0.516 kg. per head, respectively.

Two lots of steers were fed chopped straw, potatoes, rice meal, cotton-seed meal, and rye. Lot 1 received 2.5 kg. and lot 2, 1.8 kg. of digestible protein,

and the average daily gains were 0.769 kg. and 0.731 kg. per head, respectively.

The utilization of fat in the animal body, G. LAFON (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 16, pp. 1248-1250).—The author made a study of the fat content of the arterial and venous blood of certain muscles of horses, dogs, and rabbits at repose and under activity. He concludes that fats are utilized directly, in the same amount as glucose, in the activity of tissues, especially in muscular activity.

Determining the age of cattle, J. BRANDL (*Monatsh. Landw.*, 6 (1913), No. 3, pp. 69-85, figs. 12).—A method of judging the age of cattle by the size, shape, and character of their teeth is considered.

A critical consideration of the usefulness of averages and relative figures in investigations in breeding, W. GAUDE (*Deut. Landw. Tierzucht*, 17 (1913), Nos. 6, pp. 73-75; 7, pp. 73-75).—A reply to criticisms made because data previously reported by the author (*E. S. R.*, 27, p. 675) were not treated by modern biometrical methods.

The progress of stock breeding in the State of Sao Paulo (Brazil), L. MISSON (*Ann. Gembloux*, 22 (1912), No. 8, pp. 458-508, pls. 24; abs. in *Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 10, pp. 2209-2216).—This is a résumé of the work of live-stock associations and others for the encouragement of cattle, horse, swine, and mule breeding in the State of Sao Paulo.

[Live stock in Bosnia] (*Die Ergebnisse der Viehzählung in Bosnien und der Hercegovina, 1910. Scrajevo: Govt., 1912, pp. XXI+220*).—This is a statistical report of live stock conditions in Bosnia and Herzegovina.

[Live stock], C. A. PENNING (*Jaarb. Dept. Landb. Nederland, Indië, 1911, pp. 271-296, pls. 2*).—This is a general and statistical review of the live stock industry in the Dutch East Indies.

A book on cattle raising, H. DE LAPPARENT (*Elevage des Bêtes Bovines, Paris, 1913, pp. 168, figs. 20; abs. in Jour. Agr. Prat., n. ser., 25 (1913), No. 12, pp. 373, 374*).—This volume, which is based on personal observations and experience of the author, discusses institutions for fostering animal production in France, French breeds of cattle, choice of breeding stock, breeding, barns, accidents, and diseases.

Steer feeding on Alberta demonstration farms, H. A. CRAIG (*Farmer's Advocate*, 48 (1913), No. 1079, p. 877).—The results of feeding tests in 1911 and 1912 at 4 different demonstration farms were as follows:

Steer feeding tests in Alberta.

Farm.	Number of steers.	Buying weight.	Gain per head.	Average selling price per steer, including price of hogs.	Average purchase price per steer.	Gross profit per head.	Net gain per head
		<i>Pounds.</i>	<i>Pounds.</i>				
1.....	100	1,244	128	\$104.09	\$65.35	\$38.74	\$17.50
2.....	106	1,125	200	94.85	65.49	29.36	4.60
3.....	103	1,335	163	112.92	76.09	36.83	9.20
4.....	82	1,325	179	112.74	75.54	37.20	11.13

The feeding period was approximately 6 months, and the ration consisted of 14 lbs. chops (oats and barley 2:1) and green cut feed per steer, fed twice a day.

Cattle raising in Tunis.—Crossing zebu with native cattle, M. REIDERER (*Bul. Agr. Algérie et Tunisie*, 19 (1913), No. 8, pp. 176-182).—Historical notes on cattle raising in Tunis are followed by an account of attempts to improve native cattle by crossing with several European breeds but more especially with the zebu.

The offspring from the European-native crosses are almost always superior to the native cattle, but they are not immune to the cattle diseases of Tunis. The zebu-native hybrids, which are described in detail, are immune to almost all of the local diseases. They are larger than the native cattle, weighing from 500 to 600 kg. (1,100 to 1,320 lbs.) per head, produce excellent beef, make good work cattle though somewhat wild, and are fair milkers, giving milk of good quality.

Crosses between **Algau** and **African** cattle, SPANN (*Deut. Landw. Tierzucht*, 17 (1913), No. 2, pp. 18-20, fig. 1; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 3, pp. 437, 438).—Algau bulls crossed with the native cows of Cape Province produced offspring with greater weight, broader rump, and increased milk production.

Calf rearing on the emulsion system, P. SCHUPPLI (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 2, pp. 167-173).—This is a report of work carried on at the Graberhof school of Alpine economy during 1905-1912, testing the economic and feeding value of the emulsion system of rearing calves, as compared with the whole milk method.

The emulsion milk is made by adding 35 gm. of coconut fat to 1 liter of skim milk, thereby producing milk of about $3\frac{1}{2}$ per cent fat content. This mixture is heated to 60° C. and passed through an emulsion drum, thoroughly incorporating the fat globules in the bulk of the milk. To prevent scouring, the skim milk is previously pasteurized.

On the emulsion system 258 calves tested made an average daily gain per calf of 1.82 lbs. The cost of rearing heifer calves on whole milk and some skim milk averaged £11 8s (about \$55) per calf, while those reared on whole milk, emulsion milk, and skim milk cost £8 7½d. The cost of raising bull calves was somewhat greater, as were also the gains from substituting the emulsion.

Comparisons of different breeds of sheep, R. WALLACE (*Jour. Farmers' Club [London]*, 1912, Dec., pp. 128-141).—A general discussion of breed characteristics of the sheep, the influence of environment upon breed type, the effect of soil and climate, the changes resulting from the crossing of breeds, the economic importance of the different breeds, and other related subjects.

Influence of Cheviot on the Kentish sheep, W. J. MALDEN (*Live Stock Jour. [London]*, 77 (1913), No. 2040, p. 492, figs. 4).—This article discusses the probable effect on the quality of wool of the Kentish sheep as a result of a former impregnation with Cheviot blood.

[Carcass competition records—sheep], R. WALLACE (*Jour. Farmers' Club [London]*, 1912, Dec., pp. 142-153).—A report of a carcass competition in sheep, giving data on the live weights, dressed weights, fat, pluck, and skin, of long-wooled, short-wooled, and crossbred wethers.

Sheep raising in Ontario (*Ontario Dept. Agr. Bul.* 214, 1913, pp. 16).—This is a report of 2 years' work in sheep feeding trials on 9 different farms to determine the possible profits accruing from practical feeding operations. The average size of the flocks was 11 ewes, which produced an average of 14 lambs per flock per year. Data are given on the cost of feed for both ewes and lambs, with a detailed account of their disposal and the receipts therefrom.

The cost per flock, including feed for lambs and ewes, the losses, and interest on investment, ranged between \$39.43 and \$123.39 per flock, depending upon a

variety of circumstances. The profits per flock, including receipts from both wool and lambs, ranged from \$9.47 to \$118.56.

Production of wool in Spain, F. T. F. DUMONT (*Daily Cons. and Trade Rpts.* [U. S.], 16 (1913), No. 100, pp. 544, 545).—This is a report of sheep and wool production in Spain and its relation to American import trade.

Fat lambs at Ruakura, P. McCONNELL (*Jour. Agr.* [New Zeal.], 6 (1913), No. 3, pp. 271-275, figs. 6).—A report of breeding experiments with 600 Lincoln Romney ewes, half of which were bred to Border Leicester rams and half to Southdown rams. The gross profits realized from the lambs of the Leicester cross in addition to the wool receipts were \$5.31 per ewe, as compared with gross profits of \$6.04 per ewe from the Southdown cross.

In a comparison of the live and dressed weights of a lamb from both crosses the Leicester cross gave 98 and 64 lbs., and the Southdowns 78 and 48 lbs., respectively. The Southdown carcass was superior in quality.

The breeding of sires, J. GRIFFITHS (*Live Stock Jour.* [London], 77 (1913), Nos. 2029, pp. 176, 177; 2036, pp. 378, 379; 2038, pp. 431, 432; 2039, pp. 458, 459, figs. 7).—A discussion of the effects of inbreeding, cross breeding, and line breeding on the prepotency, fertilizing power, size, and character of stallions.

Alfalfa hay for horses, A. D. FAVILLE (*Wyoming Sta. Bul.* 98, pp. 8).—This bulletin reports that experiments with 6 horses fed during 10 one-month periods on alfalfa hay "showed a total gain of 203 lbs., while during an equal period on native hay there was a total loss of 84 lbs." Analyses of Wyoming alfalfa and native hay are included.

Fattening hogs in Alabama, D. T. GRAY, L. W. SUMMERS, and L. W. SHOOK (*Alabama Col. Sta. Bul.* 168, pp. 233-284, figs. 14).—In experiments covering a period of 2 years, comparing the feeding value of peanut pasture and dry feeds for pigs weighing from 40 to 60 lbs., a ration consisting of peanut pasture and corn and tankage, 4:1, gave better results both in average daily gain and in cost of feed than dry feeds composed of corn alone, corn and tankage, or corn and cowpeas (seeds). During 1911-12 the estimated total value of pork made on each acre of peanuts, after deducting the cost of concentrates, ranged from \$30.32 to \$40.08, and the carrying capacity per acre ranged from 45 to 56 days for 10 pigs. During 1912-13 the value of pork made ranged from \$17.29 to \$25.07 per acre, and the carrying capacity per acre per 10 pigs, from 32 to 42 days.

Experiments with similar pigs comparing dry-lot feeding during the mid-winter months with a grazing system of feeding gave the following results: Lot 1, fed corn and tankage 4:1 made an average daily gain per head of 0.91 lb., costing 5.86 cts. per pound of gain. Lot 2, fed corn and tankage, and rye pasture, gained correspondingly 0.63 lb., costing 4.34 cts. per pound; and lot 3, fed corn and tankage and rape pasture, 0.68 lb., costing 4.04 cts. per pound. The estimated value of 1 acre of rye pasture in terms of corn and tankage was \$4.21, and of rape pasture, \$14.01.

A one-half grain ration proved to be preferable to a one-fourth grain ration as a supplement to pasture. With the former the estimated total pork production of rape per acre was 667 lbs., and with the latter 455 lbs. During the finishing period following these forage experiments, the lot fed the one-fourth grain ration made 1.05 lbs. average daily gain per head; that on the one-half grain ration, 0.8 lb.; and the lot on a full grain ration, 0.81 lb. However, in another experiment these results were reversed, for during a finishing period of 28 days greater and more economical gains accrued from those previously dry-lot fed.

Experiments were made to demonstrate the advantages of cowpea pasture. On a ration consisting of corn and tankage 9:1, and cowpea pasture, there was

produced an average daily gain per head of 0.97 lb., costing 8.35 cts. per pound of gain, with a ration of corn and tankage 9:1 the corresponding values were 0.54 lb., and 7.16 cts.; with corn, shorts, and cowpea pasture 0.94 lb., and 8.96 cts.; and with corn and cowpea pasture 0.9 lb. and 8.8 cts. In another test, with rice polish and tankage 9:1, there was produced 0.9 lb. average daily gain per head as compared with 0.94 lb. corn and tankage 9:1 and 1.08 lbs. with a field of corn and cowpeas "hogged off." The respective costs were 5.03, 4.81, and 4.32 cts. per pound of gain.

Experiments in comparing soy bean, cowpea, and velvet bean pastures as grazing crops for hogs were inconclusive, as most of the pastures were unsatisfactory. There was a saving of dry feed effected by the use of these pastures, but large areas were required.

In 3 separate tests in which 45 hogs weighing from 45 to 80 lbs. were used, lot 1, fed on corn alone, proved unsatisfactory, with an average daily gain per head of approximately 0.4 lb., at a cost ranging from 7.55 cts. per 1 lb. gain to 11.14 cts. Lot 2, fed corn and wheat shorts 2:1, produced approximately 0.84 lb. average daily gain, costing from 6.62 to 8 cts. per pound of gain; and lot 3, fed corn and skim milk 1:2.2, produced an average daily gain of 1.33 lbs., costing from 4.95 to 6.77 cts. per pound of gain.

Swine feeding experiments with soy-bean meal, E. HASELHOFF (*Fühling's Landw. Ztg.*, 61 (1912), No. 12, pp. 401-414; *abs. in Zentbl. Agr. Chem.*, 41 (1912), No. 11, pp. 774-777).—This is a report of experiments with 36 pigs, testing the feeding value of soy-bean meal as compared with other concentrated feeds.

Three lots of 4 pigs each, fed a basal ration of ground corn and wheat, potatoes, and skim milk, in addition to the special feed gave the following results: Lot 1, fed barley grain and meat meal, produced 100 kg. gain at a cost of 89.43 marks (9.67 cts. per pound): lot 2, fed sesame meal, for 89.63 marks; and lot 3, fed soy-bean meal, for 87.38 marks. In a second experiment, 2 lots of 6 pigs each, fed barley grain in addition to a basal ration of potatoes, rape, corn, and fish meal, produced 100 kg. of gain at a cost of 99.16 marks, and 2 other lots, fed soy-bean meal, for 92.74 marks.

Cooked pig feed, S. SPENCER (*Live Stock Jour.* [London], 77 (1913), No. 2038, p. 441).—This is a discussion of the results of 4 experiments conducted at the experiment station, Clonakilty, Ireland, to ascertain the value of cooked food for pigs.

On a ration of cooked potatoes, carrots, meal (corn and barley), milk, and alfalfa, 17 3-month-old pigs made an average daily gain of 1.2 lbs. per pig, requiring 3.23 lbs. dry matter to produce 1 lb. live weight. Seventeen other pigs fed a similar ration, uncooked, made an average daily gain of 1.32 lbs., requiring 2.96 lbs. dry matter to produce 1 lb. live weight. The results indicated that the uncooked feed produced greater gains on less feed and at a lower cost, and that the percentage of offal was less than with pigs fed the cooked feed.

Embryology of the chick and the pig, F. R. LILLIE (*Chicago, 1913*, pp. XIV+49).—This pamphlet treats of laboratory methods in the study of embryology.

The western poultry guide, C. McALISTER ET AL. (*Salem, Oreg.* [1913], pp. 85, figs. 10).—This is a compilation of general articles on poultry management.

Poultry notes, R. H. WAITE (*Maryland Sta. Bul.* 171, pp. 81-104, figs. 26).—This consists of a series of illustrations, with brief explanatory notes, relating to poultry houses and appliances, care of fowls, poultry rations, diseases, etc.

Scientific view of Barred Rock color standard, P. B. HADLEY and J. H. ROBINSON (*Farm Poultry*, 24 (1913), No. 6, pp. 137, 138, fig. 1).—This is a discussion of the standard requirements in the barred plumage pattern in Barred Plymouth Rocks, in which Robinson takes exception to Hadley's contention that a standard requirement for barring pattern in the male and female birds is impracticable due to a fundamental variation in the germ cells. The latter contends that the male offspring is homozygous for the barring character, due to a combination of these characters received from both its parents, but that the female offspring is heterozygous, receiving its barring character from only one parent, the male. Hence, since barring is an inhibiting factor for black, the homozygous birds (males) are fundamentally lighter colored than the heterozygous (females).

In order to prove that the female inherits barring from the father only, the case is cited in which a Barred Plymouth Rock male was crossed on Rhode Island Red females, and vice versa. Barred progeny resulted in the first case, but in the second case only the males were barred, since the females inherited this character from neither father (Rhode Island Red) nor mother (Barred Plymouth Rock). As against this is cited the case of experiments at the Cornell Station in which White Leghorn males were crossed on Barred Plymouth Rock females, producing barred females. Similar results in the personal experience of the author are also cited.

This phenomenon is explained by Hadley as being due to the latent barring character found in the White Leghorns which exerts itself when this cross is made, providing the male is not pure for white. It is said that perhaps all White Leghorns contain this barred character, the males being homozygous for barring and the females heterozygous.

Examples are given in which barred flocks have been built from a foundation White Leghorn male. Evidently this male was not pure for white and the latent barred character became evident. Had this White Leghorn male been pure for white this character would have dominated over the black or barred character.

Hadley's general conclusion is that the homozygous condition of the male and the heterozygous nature of the female with respect to this barring character prevents a remodeling of the standard regulations for the plumage of the Barred Plymouth Rock breed. It is stated that further information is to follow in a bulletin from the Rhode Island Station.

Digestion in the chick, T. P. SHAW (*Amer. Jour. Physiol.*, 31 (1913), No. 7, pp. 439-446).—This paper is a discussion of investigations upon the digestive functions of the chick and of the physiological processes involved during digestion. Two series of experiments were conducted: One, to determine the action upon starch, protein, and fat of the digestive ferments from the floor of the mouth, crop, stomach, pancreas, and mucous membrane of the small intestine; the other, the action of the ferments upon the contents of the digestive tract. Conclusions from these investigations were as follows:

"Extracts of the glandular structures of the floor of the mouth contain amylolytic ferment active in an alkaline medium. This ferment was found in extracts from a chick one hour after hatching. The crop secretes no ferment. The crop acts as a digestive organ by retaining the food for a considerable time, thereby allowing the ptyalin in the saliva to act on the starch content. By the second day the stomach of the chick secretes a gastric juice which contains proteolytic and curdling ferments active in acid medium.

"The pancreatic secretion in the chick contains proteolytic, amylolytic, and lipolytic ferments which act best in a slightly alkaline medium. The functions of the pancreas are imperfectly developed before the seventh day after

birth. The liver of the chick contains glycogen on the twentieth day of incubation. It becomes glycogen-free 24 hours after hatching if no food has been given. Glycogen was found in the liver on the second day after food containing starch had been given. Lactose is not a glycogen-former in chicks and acts as an irritant to the gastro-intestinal mucosa."

[Food supply for ducks], G. R. MICKLE (In *The Increase of the Food Supply for Ducks in Northern Ontario*, Toronto: Govt., 1913, pp. 3-7).—It is recommended that wild celery (*Vallisneria spiralis*), floating pond weed (*Potamogeton natans*), and other plants be grown in northern Ontario in order to increase the food supply for wild ducks in that region.

Successful incubation and brooding, J. W. HURST (London [1911], pp. 114, figs. 16).—This is a general guide to the hatching and rearing of poultry by artificial means.

Fur farming in Canada, J. W. JONES (Montreal: Govt., 1913, pp. VIII+166, pls. 29).—The author treats of methods of breeding and raising fur-bearing animals and discusses their economic importance.

DAIRY FARMING—DAIRYING.

Eighth report of feeding experiments at the agricultural college of Norway, 1911-12, H. ISAACHSEN ET AL. (Ber. Foringsforsøks Stat. Norges Landbrukshøiskole, 8 (1911-12), pp. 70, figs. 17).—This report includes accounts of the following experiments:

Brush meal and its value for dairy cows, E. Fridrichsen (pp. 5-10).—The brush meal was made by running twigs, leaves, and branches of deciduous trees through a grinder to the size of a wheat kernel. The average composition was dry matter 80.6, ash 2.41, protein 6.61, fat 4.12, fiber 28.45, and nitrogen-free extract 39.01 per cent. The digestion coefficients obtained in trials with 2 goats were as follows: Organic matter 38.6, protein 27.1, albuminoids 18.9, fat 61.7, nitrogen-free extract 47.1, and fiber 26.4 per cent. In a feeding experiment with 8 cows lasting 80 days (experimental period proper 30 days) the brush meal was found to have a value similar to cut straw, pound for pound, and was relished by the cows. In the case of a hay or straw famine it may be considered a valuable substitute for these feeds.

Comparisons of 2 and 3 times a day milking, A. Lamlin and I. Grande (pp. 11-33).—Two experiments were conducted, 1 according to the group system with 8 cows and the other according to the period system with 9 cows. The first experiment showed that cows producing from 10 to 12 kg. milk per day were able to maintain their milk flow better on milking 3 times a day than when milked twice a day, producing from 0.7 to 0.8 kg. more per head daily. The more frequent milking did not influence the fat content of the milk in either experiment. In the second experiment cows milking from 10 to 15 kg. daily produced, on the average, 1 kg. more milk per head daily on milking 3 times a day than when milked twice daily. For cows milking only from 4 to 6 kg. daily no appreciable increase in yield was obtained by milking 3 times a day.

Comparative trials with the Hegelund method of milking and common good milking, I. Grande (pp. 34-47).—The results of an experiment with 8 cows lasting 105 days (experimental period proper 55 days) showed that the amount of milk obtained by the Hegelund method of milking was no higher than that obtained by common good milking, and the percentage of fat was not appreciably changed by this method. It took a longer time and gave a higher sediment content in the milk (as determined by the Gerber method) than did ordinary milking.

The fat content of milk at different stages of the milking, after incomplete milking, and in the milk remaining in the udder after the calf has taken some. H. ISAACHSEN, A. LALIM et al. (pp. 48-70).—Trials with several cows showed that the fat content of the milk increases gradually and slowly at first during the milking, while toward the end the increase is very rapid. The first drawn milk generally contained less than 1 per cent fat and the last drawn from 10 to 11 per cent. If a portion of the milk is left in the udder, the fat content of the first drawn milk in the next milking is not higher than is ordinarily the case, and there was no indication that the fat which is supposed to have been held back in the udder until the end of the milking reappears in later milkings.

There was no indication that the calf preferably gets the richest milk, as the fat content of the milk obtained after the calf has taken about half of the milk increases in the same proportion as when the milking is wholly done by hand. There was no appreciable change in the percentage and amounts of solids-not-fat in different parts of the same milking.

Maize distillery residues as a feed for milch cows: Influence on the composition of the milk. I. WEISER (*Köztelek [Budapest]*, 22 (1912), No. 83, pp. 2862, 2863; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 2, pp. 267-269).—From experiments carried on in 1912 at the Royal Chemical Experiment Station at Budapest it is concluded that "feeding large quantities of wet distillery residue does not affect the composition of the milk enough to have any importance in practice." The specific gravity and refractive index of the different periods of wet and dry feeding showed very little change, and the fat content remained practically the same.

The utilization of Sudan durra (*Bul. Imp. Inst. [So. Kensington]*, 11 (1913), No. 1, pp. 33-46).—Experiments in testing the nutritive value of "Sudan meal" as a feed for dairy cows indicated that it compares favorably with "maize meal," the yield of milk and percentage of milk fat being practically identical.

On the relation of the body weights of dairy cows to their production. F. W. WOLL (*Proc. Soc. Prom. Agr. Sci.*, 33 (1912), pp. 23-28).—In a continuation of work previously noted (*E. S. R.*, 28, p. 74) the author presents data on the average yield and cost of production for 355 cows of body weights ranging from under 900 to over 1,400 lbs. The records were obtained from over 50 different farms and dairies and included 145 Holsteins, 75 Jerseys, and 135 Guernseys. The relation between the body weight and the average yield of milk fat is shown in the following table, in which the various data are calculated as percentages of the results found for cows weighing 900 lbs. and under:

Relation of the production of dairy cows of different body weights, calculated as percentages.

Average weight.	Fat produced.	Value of products.	Cost of feed.	Net returns.	Feed units.	Per 100 feed units.	
						Fat produced.	Value of products.
100	100	100	100	100	100	100	100
112	114	115	116	113	108	105	106
126	122	124	126	122	117	105	107
139	130	135	137	133	125	105	109
151	138	143	152	133	134	103	104
163	144	150	153	147	137	105	109
184	155	161	160	162	143	109	113

The above data indicate that "the yield of butter fat increased with the average body weight of the cows, and the feed units eaten, the cost of the feed, and net returns likewise increased as the weight of the cows increased." These results are explained on the presumption that "a large animal has a relatively smaller body surface than a small animal, and the radiation of heat from the former is therefore proportionately smaller than that from a small animal; hence a larger proportion of the feed eaten by heavy cows is available for milk production, and per unit of feed eaten a larger production is made and greater net returns secured from the herd in the case of such cows." The author would not discountenance the smaller breeds of cattle on this account, but concludes that "large animals within a breed are on the whole preferable to small ones and may be depended on, as a general proposition, to make both the largest and most economical production of dairy products for their owners."

There is included a discussion of the items of expense and comparative financial returns for large and light types of cattle.

The milking trials, 1912, F. J. LLOYD (*Jour. Brit. Dairy Farmers' Assoc.*, 27 (1913), pp. 97-138).—Milking trials with 109 cows of the Shorthorn, Lincolnshire Red, Jersey, Guernsey, Red Poll, Ayrshire, South Devon, Kerry, and Dexter breeds indicated in 1912 a higher yield with richer quality than during previous years. This is thought to be due in part "to the growing appreciation of milk records which enable dairy farmers to discover and select the best cows worthy to compete in the milking trials." From these trials it was noted that "as a general rule, while the morning's milk contains less fat than the evening's milk, on the other hand it almost invariably contains more solids other than fat than the evening's milk. This is all the more striking, because, as a rule, milk rich in fat contains high solids other than fat. The former appears to be a diurnal variation common to all breeds, the latter a breed characteristic, those breeds giving most fat also giving most solids other than fat."

Report of dairymen (*Landw. Jahrb. Bayern*, 2 (1912), No. 1, pp. 66-111).—Records of 1,000 cows are given, including milk yields, percentage of butter fat, and length of lactation period.

Cow-testing associations, G. H. HIBBERD and G. E. WOLCOTT (*Maryland Sta. Bul.* 169, pp. 29-72, figs. 7).—An account of the first year's work of the first Maryland cow-testing association, with detailed herd records furnished the station by this and other associations and individuals, and a discussion of dairy rations.

The present state of dairy cow testing (*Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 10, pp. 2216-2248).—This includes a bibliography of publications on herd testing, and a detailed account of the work of associations in Denmark, Switzerland, Germany, Sweden, and elsewhere.

The elimination of the unprofitable cow, J. WILSON (*Mark Lane Express*, 109 (1913), No. 4261, pp. 747, 749).—The author presents a diagram illustrating the relations of the 3 factors of cost of production, milk yield, and selling price, and demonstrating the possible variation in profits as these factors vary. Methods of breeding for high production are also considered.

Report of the dairy commissioner, C. MARKER (*Ann. Rpt. Dept. Agr. Alberta*, 1911, pp. 98-132, pl. 1).—This report includes a consideration of the items of expense incurred in creamery practice. It is claimed that there is approximately 6 cts. difference per pound of butter in operating expense against a creamery with a yearly output of 10,000 lbs., as compared with one of 115,000 lbs. Data are presented on the output and financial returns of government operated plants; also a discussion of the government system of cream grading and the paying of a premium for quality.

In a table showing the comparative quality of butter from all creameries for 3 full seasons, it is seen that the number of samples grading first has increased from 72.39 per cent in 1909 to 84.53 per cent in 1910 and 85.67 per cent in 1911.

Dairy farming with sheep, E. H. HAGEMANN (*Live Stock and Dairy Jour.*, 12 (1913), No. 5, pp. 19, 20, figs. 3).—This article discusses dairy farming with the Merino and Shropshire breeds of sheep in California. The milk is manufactured into several kinds of cheese and is of commercial value. The sheep average 1 pt. of milk per day, testing 8 per cent of fat.

Composition of cow and goat milk, with special reference to the refraction of the calcium chlorid serums, K. ALPERS (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 23 (1912), No. 10, pp. 497-513; *abs. in Hyg. Rundschau*, 23 (1913), No. 9, pp. 553-554).—A comparison of the refractive power of cow and goat milk, with a consideration of the means of detecting the adulteration of retail milk.

Slime-making bacteria in milk, J. THÖNI (*Molk. Ztg. Berlin*, 23 (1913), No. 17, pp. 194, 195).—The author attributes sliminess in milk to the presence of a slime-forming bacterium, *Micrococcus mucofaciens*, colonies of which when fully developed are of a golden brown color. These bacteria develop best at 35° C., and their presence is noted in from 14 to 16 hours, while at 42 hours it is readily distinguished. The bacteria are destroyed in 30 minutes at a temperature of 60° or in 5 minutes at 70°.

Pasteurizing milk cheese, J. H. MONRAD (*N. Y. Produce Rev. and Amer. Cream.*, 36 (1913), No. 6, p. 244).—This is a comment as to the practical value of "pasteurized milk cheese," as proposed by the Wisconsin Station (E. S. R., 28, p. 581), in which the author discusses the increased moisture content of this cheese, its flavor, and the necessity of a first-class starter.

[Moisture and fat content of cheese], W. E. GWILLIM (*Jour. Agr. [New Zeal.]*, 6 (1913), Nos. 1, pp. 51-57; 2, pp. 173-178).—Examinations of samples of Cheddar cheese from a number of factories showed a variation in moisture content of from 33.6 to 37.7 per cent, and in fat content from 33.2 to 36.8 per cent. Reports are given of the moisture, fat, and casein content, and the general character of 206 samples of cheese examined.

"Bankrote" cheese, K. TEICHERT (*Molk. Ztg. [Hildesheim]*, 27 (1913), No. 26, pp. 489, 490).—The author discusses the various theories presented for the causes of red coloring in cheese. Some investigators hold that it is due to bacteriological causes, others that iron oxids affect the cheese chemically, while still others attribute the red coloring to the direct influence of the wooden cheese containers or shelves. The author holds to the last view. Samples were examined showing no trace of color producing bacteria or of iron, but the presence of vanillin, koniferin, and hadromal was detected when the wood test was used. The other causes are not deemed improbable, but the chief cause is ascribed to the penetration of the wood juices from both the white and red pine.

Brick ice cream, C. J. O'NEIL (*N. Y. Produce Rev. and Amer. Cream.*, 36 (1913), No. 6, pp. 266, 267).—In this article the author discusses the importance of layer brick ice cream and of its popularity upon the general market due to its attractiveness, variety of flavor, and comparative cheapness. There is included a detailed account of methods of making the 2- and 3-layer and fancy bricks.

Yoghourt and its preparation, M. HOHENADEL (*Arch. Hyg.*, 78 (1913), No. 4-5, pp. 193-218, pl. 1).—This is a treatise on the bacteriological character of yoghurt, in which the findings of Metschnikoff and other bacteriologists are discussed. Examinations of *Bacillus bulgaricus* in agar and bouillon media at different temperatures led to the conclusion that the optimum is 45° C.

On yoghourt, A. SCHOLL (In *Festschrift 84. Versamml. Deut. Naturf. u. Ärzte von der Med. Naturw. Gesell. Münster, 1912*, pp. 112-122).—This is a treatise on the bacteriological character of yoghourt, its manufacture, and composition.

Yoghourt control, A. GABATHULER (*Ztschr. Fleisch. u. Milchhyg.*, 23 (1913), No. 16, pp. 368-373, figs. 3).—This is a discussion of the methods of preparation and control of the *Bacillus bulgaricus* culture used in yoghourt manufacture.

VETERINARY MEDICINE.

Ophthalmology for veterinarians, W. N. SHARP (*Philadelphia and London, 1913*, pp. 210, pl. 1, figs. 44).—This work deals with the various affections of the eye in domestic animals, with directions for their treatment.

Report of the veterinary sanitary board of Denmark, 1911, P. GRUNTH and P. HANSEN (*Aarsber. Vet. Sundhedsr.*, 1911, pp. XIX+354).—This report contains rulings and decisions of the board, laws affecting animal diseases, and accounts of outbreaks of contagious and other diseases in Denmark during the year.

Report of the National Serum Institute of Holland, J. POELS (*Verlag Rijksseruminricht. [Holland], 1908-1910*, pp. 118).—This is a report of the activities of this institution for 1908, 1909, and 1910, and deals with the production, distribution, and examination of sera and biologic products and the results obtained from the use of these preparations. The pathological specimens sent to the institution for diagnosis are described.

Vaccine and serum therapy, H. G. ANNETT (*Vet. Rec.*, 25 (1912), No. 1257, pp. 83-86).—A theoretical and practical description of the topic, discussed from the standpoint of veterinary medicine.

Methods of sero-diagnosis applicable to diseases of stock in South Africa, D. KEHOE (*So. African Jour. Sci.*, 9 (1913), No. 8, pp. 196-214).—A review of the theories pertaining to immunity work in this connection, and of some of the applications of biological methods for diagnosing diseases in stock.

The sero-diagnosis of pregnancy, E. ROSENTHAL (*Biochim. e Terapia. Sper.*, 3 (1911), pp. 160-162; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 5 (1912), No. 15, p. 1188).—In some previous work it was found that the serum from pregnant subjects was strongly antiproteolytic. The author now reports on some tests with the serum obtained from 120 subjects, pregnant and nonpregnant, made for the purpose of determining whether this method could be used for diagnosing pregnancy. It was found that as pregnancy progresses, the antiproteolytic power increases. Fulda's casein method was used. Attention is also drawn to the fact that an antiproteolytic reaction can be obtained in cases of carcinoma, nephritis, and other diseases in man.

The epithelial bodies of the thyroid and the accessory thyroid of the bovine, calf, sheep, hog, and dog, W. BARTZ (*Über die Epithelkörperchen der Thyreoidea und die Nebenschilddrüsen bei Rind, Kalb, Schaf, Schwein, Hund. Inaug. Diss., Univ. Bern, 1910*, pp. 44, pls. 2).—A study of the parathyroid glands of these animals.

A chemical study of the liver of the bovine, A. DANIEL-BRUNET and C. ROLAND (*Bul. Sci. Pharmacol.*, 19 (1912), No. 6, pp. 347-349; *abs. in Chem. Zentbl.*, 1912, II, No. 9, p. 729).—The results of examining the livers of 6 steers, 7 cows, and 12 oxen are reported. An analysis of the bile is also included.

Some further studies in regard to pollen toxin, O. KAMMANN (*Biochem. Ztschr.*, 46 (1912), No. 1-2, pp. 151-169, figs. 2).—From rye pollen a toxin can be obtained which has marked specific properties. The toxin contains a hema-

toxin amboceptor which, after activation by lecithin and serum lipoids, acts hemolytically on blood corpuscles.

Pollen contains proteases, diastases, catalases, and lipases.

In regard to the properties of pyocyanase, M. ISABOLINSKY (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 67 (1913), No. 7, pp. 532-540).—The results indicate that pyocyanase when tested against *Bacillus diphtheriæ*, *B. typhosus*, *B. paratyphosus*, *B. coli*, *B. anthracis*, *B. pyocyaneus*, *B. suisepicus*, *B. rhusiopathiæ*, and streptococci, possesses no bactericidal properties. The sera obtained by treating rabbits with pyocyanase, however, have all the properties of immune sera.

Technique for preparing antihog erysipelas and antianthrax serum, B. PATZEWITSCH and M. ISABOLINSKY (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 68 (1913), No. 1, pp. 117-122).—The method proposed for the antierysipelas serum consists of treating horses intravenously with a culture of the *Bacillus rhusiopathiæ suum* taken from the blood or bone marrow of hogs dying from erysipelas, or from the heart blood of infected pigeons. For the antianthrax serum strains of the asporogenic and spore viruses were employed, the former being given subcutaneously and the latter intravenously. The organisms were obtained from a horse, bovine, sheep, and a man.

The detection of anthrax with the precipitation method, SCHÜTZ and PFEILER (*Arch. Wiss. u. Prakt. Tierheilk.*, 38 (1912), Nos. 3, pp. 207-242; 4, pp. 311-372).—Precipitating anthrax sera can be prepared with the rabbit, sheep, bovine, ass, and horse. The ass is the preferable animal. It was found advantageous to give larger quantities than is the custom with living organisms of low or medium virulence. The formation of precipitating antibodies depends upon the animal and the kind of culture used. The antibodies are produced in large amounts in about 5 days' post infection, and they vanish in some individuals sooner than in others. The titer of the various sera prepared varied, but for the precipitation reaction only such sera can be used as produce a precipitate immediately with spleen extracts from animals affected with anthrax.

The most certain method for preparing the antigen (spleen extracts) is Ascoli's method, but with a previous extraction with chloroform. The precipitation reaction, on the basis of 1,700 tests carried out in the Pathologic Institute of the Veterinary High School at Berlin, is considered absolutely specific for diagnostic purposes.

Ascoli's thermoprecipitin reaction for diagnosing anthrax, G. FLORIS (*Deut. Tierärztl. Wchnschr.*, 20 (1912), No. 14, pp. 211, 212).—Ascoli's method is deemed a certain method for detecting the presence of anthrax. It gives positive results even though the material is in a state of putrefaction.

The cause for the natural immunity against the anthrax bacillus, H. KODAMA (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 68 (1913), No. 3-4, pp. 373-428).—The capsule of the anthrax bacillus, according to the author, originates from a membrane which, under various conditions, is produced by the swelling and extrusion of the membrane of the bacterial cell. The capsule is the protective apparatus for the anthrax bacterium against the action of the phagocytic, but not against the bactericidal, properties of serum.

The cause for the natural immunity of frogs, chickens, and white rats against the anthrax bacillus is different for each of the animals. The resistance of mice and guinea pigs is explained as being due to capsule formation, but the resistance which the rabbit possesses is not due to this cause.

On eczema in the horse and bovine, A. MÖRLER (*Ueber Ekzeme bei Pferd und Rind. Inaug. Diss., Univ. Bern, 1912, pp. 91, pls. 3*).—This paper includes a report of 13 cases of eczema, together with the results of remedial treatment.

Protective and curative vaccination against foot-and-mouth disease, LOEFFLER (*Molk. Ztg. [Hildesheim]*, 26 (1912), No. 5, pp. 68-70).—This is a preliminary popular description of work done with an antiserum for foot-and-mouth disease.

The Negri bodies in rabies, E. M. WATSON (*Jour. Expt. Med.*, 17 (1913), No. 1, pp. 29-42, pls. 2).—"The Negri bodies, as the etiological agent in rabies, present 2 types or phases in morphology, in growth, and in reproduction. These 2 phases are constantly cyclic in their development and correspond (1) to a multiplicative, or schizogonous, and (2) to a reproductive, or sporogonous, life cycle.

"By the detailed study of these forms and their succeeding stages we are inclined to believe that the Negri bodies are definite protozoan parasites, and from a study of their life history we are led to place them in the suborder of Cryptocysts, or Microsporidia, of the Sporozoa, and more definitely among the Oligosporogena of the Glugeidæ family, which forms produce but one pansporoblast."

Chemotherapeutic trypanosome studies with special reference to the immunity following cure, B. T. TERRY (*Monographs Rockefeller Inst. Med. Research*, 1911, No. 3, pp. 70).—"When mice infected with various species of trypanosomes are given curative doses of a number of different medicaments, an immunity to the species cured is usually demonstrable in the tests made several days later. While the interaction of trypanosomes and some form of treatment seems essential for the production of this immunity, it is not necessary for the animals to be visibly infected. . . . The immunity is specific in the sense that mice immunized to one species, show, as a rule, no resistance to infection with other species. . . . Examples of a possible nonspecific immunity were observed in mice immunized to surra of India and tested with mal de caderas and vice versa, and also in mice immunized to dourine and tested with mal de caderas.

"The production of immunity in mice following the cure of experimental trypanosome infections seems to be a general phenomenon, for it has been possible to demonstrate its presence against every strain thus far tested. The immunity develops early, being detected at times between the second and third day after treatment. The immunity following cure is temporary. In most instances it seemed strongest 4 to 6 days after treatment. Sometimes, however, it disappeared completely in 8 to 11 days, and in animals tested but once it was unusual to find much resistance 20 days after treatment. . . .

"In the experiments a strong immunity has been obtained with greater ease against the more virulent than against the less virulent trypanosomes. The infection against which it has been easiest to secure immunity was surra of India. With the less virulent dourine, on the other hand, the results have been much less satisfactory. Against the latter infection, 12 attempts to produce an efficient immunity have thus far failed. The strongest immunity was usually obtained by employing one of the dyes, either alone or in combination with acetyl-atoxyl. While acetyl-atoxyl is usually rapidly excreted, an injection of this medicament has, in a number of instances, prolonged the excretion of dichlorbenzidin plus amidonaphtoldisulphonic acid 1.8.3.6, given 4 or more days afterwards. Surra of India was particularly sensitive to dichlorbenzidin employed alone or in combination with acetyl-atoxyl.

"In treating mice with dichlorbenzidin a strong immunity was at times obtained following the injection of small quantities of the medicament. In one instance half the usual curative dose gave rise to a strong immunity against surra of India. Additional evidence that the action of dichlorbenzidin is indirect seems to have been furnished by the fact that rich intraperitoneal injec-

tions of surra of India and mal de caderas were capable of infecting mice when introduced as early as 24 hours after the medicament.

"In prophylactic and immunity experiments where infection followed by spontaneous recovery took place, the number of days intervening between the appearance of the parasites and their disappearance usually varied directly with the number of days separating the treatment and the test. From this it seems that the stronger the influence of the unexcreted medicament, the more quickly the parasites are banished from the blood. The strength of the immunity was often sufficient to prevent infection completely in the tests made comparatively soon after treatment. Such an immunity was secured in mice cured of surra of India, surra of Mauritius, mal de caderas, nagana, and a toluidin blue resistant nagana strain.

"At times, varying degrees of hypersensitiveness to infection were noted. . . . It is of interest to note that in 3 of these 5 instances of hypersensitiveness, the surra of Mauritius that infected had been passed through one or more guinea pigs. When a double infection was treated, a double immunity was secured. By means of the immunity reaction it was apparently possible in a number of instances to separate in purity organisms that had been mixed *in vitro*."

A new method for immunizing against trypanosome diseases, C. SCHILLING (*Deut. Med. Wchnschr.*, 38 (1912), No. 1, pp. 13, 14).—The method used is as follows:

Rats at the height of infection, that is, when the blood contains a large amount of trypanosomes, are bled into bouillon containing 2 per cent of sodium citrate. In this solution the trypanosomes will live for several days, it differing in this respect from sodium chlorid solutions. After centrifuging the mixture, the supernatant cloudy fluid is pipetted off, and an equivalent amount of bouillon containing 1 part to 700 of tartar emetic added to the residue. After centrifuging in an electric apparatus, a suspension is made of the residue in bouillon, and from 0.5 to 2 cc. injected into rats.

By this process the incubation period of the strain employed, nagana, was increased from 24 hours to from 4 to 27 days. In a majority of the animals a single injection will render the animals nonreceptive to later infection. In a few animals the disease recurred in a few days. The serum from such immune rats protects mice against a simultaneous infection with nagana trypanosomes. Dogs are better fitted than rats for such tests, and a single injection of trypanosomes so prepared will incite the formation of antibodies which can be detected by the complement fixation method.

Only 1 test was conducted with a horse, and the results were the same as those given by the mouse. The work with the horse, however, will be continued.

About a new culture medium for the rapid development of the tubercle bacillus, G. VALLETTI (*Centbl. Bakt. [etc.]*, 1. Abt., *Orig.*, 68 (1913), No. 2, pp. 239-241).—After pointing out that very few text-books mention milk as a possible medium for cultivating the tubercle bacillus, the author recommends a culture medium composed of bouillon agar with sodium chlorid but without glycerin, to which is added 2 cc. of serum from cow's milk. The serum is prepared by adding a few drops of acetic acid to milk and then boiling.

In this medium the bovine tubercle bacillus showed a marked development in 1 to 1½ days' post inoculation, whereas control cultures on substrats containing glycerin, blood serum, etc., showed not the slightest growth. The human type of bacillus did not develop on this medium, but whether the bovine type was selective for the medium has not been established. The author intends to conduct some tests with human milk sera to determine this point.

A method for cultivating tubercle bacilli from human and animal organs, K. K. WEDENSKY (*Centbl. Bakt. [etc.], 1. Abt., Orig., 68 (1913), No. 3-4, pp. 429-431, fig. 1*).—The isolation and preparation of pure cultures of tubercle bacilli from diseased organs is usually considered a difficult task; consequently the author proposes a method in which pieces of the organ are suspended, by means of a silk thread, in glycerin bouillon and incubated at from 37 to 38° C. As soon as small colonies are noted on the surface of the bouillon, they are removed and inoculated into other bouillon.

The nutrition of the tubercle bacillus with mineral substances, B. SAUTON (*Orig. Commun. S. Internat. Cong. Appl. Chem. [Washington and New York], 19 (1912), Sect. VIII d, pp. 267-269*).—This is a study of the effect of certain mineral substances upon the number or amount of bovine tubercle bacilli grown on a medium containing, in 1,000 parts, asparagin 4 gm., glycerin 60 gm., citric acid 2 gm., phosphate of potassium 0.5 gm., sulphate of magnesia 0.5 gm., and iron and ammonium citrate 0.05 gm. The liquid was neutralized with ammonia.

After incubating for 20 days, the cultures and media were sterilized, and the weight of the washed and dried cultures determined. The amount of cultures obtained varied between 0.9 and 1.25 gm. per cubic centimeter of liquid. Under the same conditions, when the organism was grown on glycerin bouillon, 0.6 gm. was obtained.

It is shown that when sulphur is absent from the medium only 0.12 gm. of cultures was obtained; with absence of phosphate or potassium, no growth; without magnesium, 0.03 gm.; and without iron, 0.35 gm. The potassium could not be replaced by sodium, lithium, caesium, or rubidium. Manganese could not replace iron.

Some experiments with other salts are also included.

The viability of the bovine type of tubercle bacilli given intravenously in the blood stream and the muscles of animals destined for slaughter, and determining the age of the tuberculous changes produced, C. TITZE (*Arch. K. Gsndhtsamt., 43 (1913), No. 4, pp. 607-622*).—This investigation was made with 6 goats and 7 bovines. For detecting the bacteria, which were introduced into the blood stream, the guinea pig test was used. The ordinary microscopic method for this purpose gave negative results.

The introduction of tubercle bacilli into the blood causes a lodgment of the organism in the various organs, but especially in the lungs, where it produces a catarrhal inflammation which results in specific tubercle formation in an embolic manner. From the lungs the tubercle bacilli go to the bronchial-mediastinal lymph glands. If lethal amounts of tubercle bacilli are given intravenously, tubercle bacilli can be detected in the blood and muscle tissue 23 days after infection. Clinically the disease produced by injecting the organisms intravenously manifests itself after an incubation period of from 6 to 9 days. If organisms of full virulency are inhaled, the clinical symptoms are manifest after from 10 to 14 days.

If smaller or medium amounts of organisms are given intravenously to goats or to bovines, the organisms are eliminated quickly from the blood stream. Medium amounts, however, in some instances could be noted from 7 to 9 days post infection in the blood stream. Where the organisms were found in the muscles, they were found in the blood also. On the other hand, the organisms were noted in the lymphatic glands when apparently absent from the blood stream.

In regard to determining the age of the tubercular process many discrepancies were found to exist in the literature. The shortest time after intravenous injection in which the tubercles can be noted macroscopically is about 12 days.

After from 3 to 4 weeks the embolic tubercles have the size of a pin head, and after from 5 to 6 weeks assume the size of a hemp seed. Caseation seems to be dependent upon the virulency of the organism and the number given. Calcification in 50 days, as stated by MacFadyean, is possible. The bronchial-mediastinal glands 2 weeks after intravenous infection are swollen but without the macroscopic appearance of tubercle formation.

In regard to children infected with the bovine type of bacillus, and the changes taking place in the bovine type of bacillus as a result of remaining in man for many years, A. WEBER and K. STEFFENHAGEN (*Tuberkulose Arb. K. Gsndhtsamt.*, 1912, No. 11, pp. 1-24; *abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 4, p. 64).—Five children infected with the bovine type of bacillus were kept under observation for several years. Four of the children had infections of the cervical glands but without severe systematic or local effects. The fifth child was affected with bone tuberculosis in which there were repeated exacerbations accompanied by a discharge of purulent and other secretions. With this case it was interesting to note that the bovine type of bacillus, after residing for 10½ years in the body, still retained the bovine type characteristics.

Tuberculosis in nursing children, K. STEFFENHAGEN (*Tuberkulose Arb. K. Gsndhtsamt.*, 1912, No. 11, pp. 52-170; *abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 4, p. 64).—The results of investigating 40 cases of certain tuberculosis in children showed that the source of infection was chiefly man. Only in 3 cases was the bovine type of bacilli noted, and in 1 case both types were isolated. The mesenteric glands contained the bovine type and the bronchial glands the human type.

Comparative investigations in regard to tubercle bacilli of various origins, K. STEFFENHAGEN (*Tuberkulose Arb. K. Gsndhtsamt.*, 1912, No. 11, pp. 25-51; *abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 4, p. 64).—It is stated that bovine tubercle bacilli are rarely found in adults, and in children the disease produced by the bovine type manifests itself as lymphomata coli.

Investigations in regard to the type of bacillus present in the sputum of tubercular subjects (man), E. A. LINDEMANN (*Tuberkulose Arb. K. Gsndhtsamt.*, 1912, No. 12, pp. 11-108; *abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 4, p. 64).—A description of 41 cases in which the human type of bacillus was found 40 times and the remaining case being a mixed infection. The subjects were from 20 to 30 years of age.

Tuberculous animals and the part they play in the infection of man, A. CALMETTE (*Rev. Sci. [Paris]*, 50 (1912), II, No. 17, pp. 516-519).—The author believes that the suppression of tuberculosis in man must be done from 2 focuses, (1) prevention of infection from man to man, and (2) the eradication of tuberculosis from cattle.

The tuberculous cow in relation to human health, M. H. REYNOLDS (*Amer. Vet. Rev.*, 42 (1913), No. 6, pp. 640-653).—This article shows the importance of prophylaxis against tuberculosis in bovines and as a precautionary measure against the occurrence of this disease in man. The data are accompanied by statistics.

About the value of the meiostagmin reaction for diagnosing human and bovine tuberculosis, G. RONCAGLIO (*Clin. Vet. [Milan]*, *Rass. Pol. Sanit. e Ig.*, 35 (1912), No. 15-16, pp. 633-644, fig. 1; *abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 6, pp. 103, 104).—The reaction, according to the author, is a good one for diagnosing both human and bovine tuberculosis.

A possible test for the differentiation between human and bovine types of the tubercle bacillus, J. FRASER (*Brit. Med. Jour.*, 1912, No. 2708, pp. 1432-1434).—"The most reliable test which we possess in the process of differentiation between human and bovine tubercle bacilli is the inoculation of certain

animals (most commonly the rabbit or the calf) with a small known quantity of the organism under investigation. If the infection results in a rapid dissemination of the disease and the speedy death of the animal, it may be affirmed that the bovine bacillus is present in the organism. If, on the other hand, the resulting lesions are few and tending to be retrogressive, and death ensues after a very considerable interval of time, or from some intercurrent disease, the infection may be classified as human.

"The inoculation is made intravenously, and the dissemination of the disease is a general one. When the inoculation is made locally, there results a localized development of tubercle, and the degree of local reaction varies according to whether the human or the bovine bacillus has been the causative factor. A distinction can be drawn between human and bovine bacilli by the local reaction, as well as by the general reaction produced in these animals."

In the author's opinion, the ideal situation in which to demonstrate changes is the synovial membrane of the knee joint of the rabbit.

Tuberculin testing of cattle, W. G. CHRISMAN (*Bul. N. C. Dept. Agr.*, 33 (1912), No. 7, pp. 15, figs. 6).—This deals with the activities of the North Carolina Department of Agriculture in eradicating tuberculosis from the herds of state institutions, creameries, private herds, etc.

In 1909, 79 herds of cattle, amounting to 990 head, were tested, and the results showed the disease in 0.35 per cent of the animals. The reactors represented pure-bred cattle which were brought into the State for breeding and dairy purposes.

In 1910 the amount of reactors rose to 6.87 per cent, again due to importations, 33 per cent of some car loads being reactors. A number of large herds which had been tested some years ago, and the diseased animals allowed to remain, were also retested, and in some of these herds 50 per cent of the animals were diseased and a large number suspicious, many of which reacted on subsequent tests.

In 1911 twice as many cattle were tested as in 1910, and 4 times as many as in 1909. The percentage of the reactors in 1911 was 1.4.

The work indicates that less than one-tenth per cent of the native cattle are tubercular. The cause assigned for this small percentage is the mild climate, the cattle being usually kept in barns only from about Christmas to April, and then as a rule simply for milking or during falling weather and an occasional cold day.

The results are tabulated by counties.

About the detection of tubercle bacilli in the excreta of bovines suspected of being tuberculous, with especial reference to the antiformin method, C. TITZE (*Arch. K. Gsndhtsamt.*, 43 (1913), No. 4, pp. 520-544).—The investigation, which was made with discharges from the lungs, mammary gland, and the uterus of animals suspected of having open tuberculosis, shows that the acid-fast tubercle bacilli present in bovines can not always be differentiated from other acid-fast organisms, especially the organisms causing paratuberculosis of the intestines, and the Brem-Beitzke organism occurring in water.

When considering an animal clinically tuberculous, the microscopic method will often, especially in the open cases, diagnose the presence of tuberculosis. Precaution, however, must be taken to exclude outside contamination of the sample.

Comparing the usual microscopic method with the results of preparations treated by the antiformin method, it is concluded that the latter has no marked advantages over the former. Only when much material is at hand can the antiformin or a similar method be employed for the microscopic detection of tubercle bacilli. The most certain of all methods is the guinea pig test. In this case

the discharge from the lungs or uterus is injected into guinea pigs without previous treatment, but milk must be treated with 0.5 per cent of boric acid if it is not used at once for injection. Where other organisms are present in the discharge, it is advisable to subject the suspected or pathologic material to the action of 5 per cent antiformin solution for from 2 to 3 hours. The antiformin must then be removed, and the material is centrifuged and washed only once.

For detecting open tuberculosis in bovines, the methods of Müller, Wiemann, Jonske, and Scharr and Opalka are deemed valuable.

The detection of the tubercle bacillus in the feces of bovines, H. THIERINGER (*Arb. K. Gsndhtsamt.*, 43 (1913), No. 4, pp. 545-606).—As a result of making some examinations of feces, it was found that the usual microscopic method is not satisfactory for the detection of the presence of the tubercle bacillus. The most certain method is the animal experiment. The following procedure is recommended:

A 30 gm. sample of the feces is mixed in an Erlenmeyer flask with 55 cc. of sterile water and 15 cc. of antiformin until a uniform mixture free from lumps is obtained. The mixture is then allowed to stand for 3 to 4 hours at room temperature, and during this period it is shaken occasionally. After this time, the mixture is shaken in order to get a uniform suspension, 70 cc. distributed in several centrifuge tubes, and centrifuged in a high-speed electrical apparatus for 5 minutes, or in a water power centrifuge of 1,400 revolutions per minute for 20 minutes. The supernatant fluid is then poured off, and the residue suspended in sterile water, regulating the amount of water with reference to the number of guinea pigs to be inoculated. After filtering through 2 layers of gauze, stirring constantly during the filtration process, and finally kneading the residue upon the gauze with a sterilized potato knife, the filtrate is injected in 2 to 3 cc. doses subcutaneously into guinea pigs.

Numerous kinds of pathogenic and nonpathogenic bacteria were compared in the test.

Report of the commission appointed by the ministry of agriculture, Belgium, for the purpose of determining the efficiency of Heymans' method for vaccinating against bovine tuberculosis (*Ann. Méd. Vét.*, 61 (1912), No. 8-9, pp. 417-452).—The plan of the commission was to make cohabitation tests, ingestion tests, and inoculation tests with vaccinated and unvaccinated animals, and vaccinations on a certain number of farms in which tuberculosis had been previously demonstrated to be present.

The commission reports that the method is of no practical value for vaccinating against tuberculosis. The data as reported are tabulated.

The treatment of bovine tuberculosis with Tuberculosan (Burow), H. PEBLICH (*Berlin. Tierärztl. Wehnschr.*, 29 (1913), Nos. 7, pp. 116, 117; 8, pp. 133-135).—In these experiments 39 bovines were treated with Tuberculosan (*E. S. R.*, 26, pp. 680, 681). The animals were divided into 3 groups, namely, animals pronounced tubercular on the basis of the tuberculin test, animals in the first stage of tuberculosis, and advanced tubercular subjects. The results obtained in general were satisfactory, thus confirming the findings of Burow.

The question of tick eradication, P. F. BAHNSEN (*Dept. Agr. Ga., Bul.* 6—*S. V.*, 2, ed. [1913], pp. 29).—This bulletin consists of a series of questions and answers relating to the cattle tick and its eradication in Georgia.

Cooperia oncophora in diarrheic calves, A. W. N. PILLERS (*Vet. Rec.*, 25 (1912), No. 1272, pp. 305, 306).—The author records the occurrence of a disease in 9 calves, apparently caused by this parasite in the walls of the small intestines.

Hog cholera, B. M. BOLTON (*Maryland Sta. Bul.* 174, pp. 135-169, figs. 6).—The author discusses the history of this disease, its nature, contributing causes,

symptoms, post-mortem appearances, differential diagnosis, and the manner of dealing with it, including the production of antihog cholera serum and its use, reports received from different States as to serum production, and the text of the Maryland law for the production and testing of the serum and similar products, which went into effect July 1, 1912.

Injection experiments with salvarsan in the treatment of the pectoral form of influenza of the horse, W. TEPPIG (*Impfversuche mit Salvarsan gegen die Brustseuche der Pferde. Inaug. Diss., Univ. Leipsic, 1911, pp. 46*).—The author's investigations show salvarsan to give very successful results in the treatment of this disease. A bibliography of 63 titles is appended.

Bacteriological investigations in regard to tuberculosis in the horse, ZWICK and ZELLER (*Arb. K. Gsndhtsamt., 43 (1913), No. 4, pp. 483-504*).—The investigations show that among 8 horses, the disease was produced in 5 cases by the bovine type of bacillus. Of the remaining 3 animals, the organisms obtained from 2 were characterized by a more luxuriant growth than the bovine type of bacillus gives, but so far as virulence is concerned, they behaved like the bovine type. The other strain showed an attenuated virulence toward the rabbit.

The disease in the horse is probably of bovine origin.

Canine anaplasmosis, C. BASILE (*Pathologica, 4 (1912), No. 87, pp. 358-360; abs. in Trop. Vet. Bul., 1 (1912), No. 1, pp. 13, 14*).—The author reports upon a case of this disease in a dog at Messina, Italy. The parasite was observed in smears made from the peripheral blood of an adult dog, which was in a very anemic and poor condition. The disease was experimentally transmitted from the affected dog to a month-old puppy through the intraperitoneal injection of blood. The inoculated dog remained healthy until the tenth day after inoculation, but *Anaplasma* was found in smears of the hepatic and peripheral blood stained with Giemsa. Blood drawn from the liver of the experimentally infected dog was injected into the peritoneal cavity of a second puppy. This second dog refused all food after 24 hours and died on the third day, the course of the disease having been very acute. The parasites were found in the blood of the peripheral vessels, spleen, and liver.

Important poultry diseases, D. E. SALMON (*U. S. Dept. Agr., Farmers' Bul. 530, pp. 36*).—This is a popular discussion of the diseases of poultry, with preventive measures and remedial treatment therefor.

Variations in a chicken sarcoma caused by a filterable agent, P. ROUS and J. B. MURPHY (*Jour. Expt. Med., 17 (1913), No. 2, pp. 219-231, pls. 9*).—"Variations are described which have from time to time occurred in the structure and behavior of a transplantable, spindle-celled sarcoma of the fowl, a growth caused, as elsewhere shown, by a filterable agent. Of late the growth has frequently given rise to fatal hemorrhages from its substance. In some of the recent, rapidly growing tumors the cells have tended to be spherical, showing only a very tardy and imperfect differentiation to the spindle form. A giant-celled form of the growth is sometimes met with. Despite their diversity the tumors grade into one another and in the final analysis are all to be considered as spindle-celled sarcomata. Attempts to obtain an action of the etiological agent upon cells other than those it usually affects have failed, as have attempts to bring about changes in the histology of the sarcomata by attenuating the agent.

"Some of the lesser morphological variations in the sarcoma are undoubtedly due to local conditions in the host, and of the more important changes some have been associated with an increase in the growth's malignancy. For others the determining conditions have yet to be discovered. On the whole the variations described are not more marked than those occasionally manifested

by the transplantable mammalian tumors, and traceable to the changes in a single strain of tumor cells during their propagation in successive hosts. In mammals the ultimate reason for these changes is not known. In the case of the chicken tumor some of them are undoubtedly the expression of changes in the growth's causative agent."

RURAL ENGINEERING.

Third biennial report of the department of engineering of the State of California (*Bien. Rpt. Dept. Engin. Cal., 1910-1912, pp. 263, pls. 56*).—This is a progress report of engineering operations from 1910-1912, including engineering service at state institutions and state buildings, laboratory testing, state highways and bridges, irrigation, river and harbor improvement, water resources, and power development.

Construction of the Kachess dam, Washington, E. H. BALDWIN (*Engin. News, 69 (1913), No. 20, pp. 989-999, figs. 11*).—An account is given of the construction of an earth dam 65 ft. high and 1,400 ft. long built by the United States Reclamation Service across the Kachess River a short distance below Kachess Lake to increase the storage capacity of the lake for irrigation purposes. Novel features of the work were the dredging of a channel from deep water in the lake toward the dam, the construction of a reenforced concrete conduit from the lower end of the dredged channel to a point near the dam, an intake tower, a reenforced concrete conduit through the dam, a spillway far to one side, the use of dump cars and a high trestle for bringing the earth to the embankment, and the use of a high timber concrete elevating tower in building the outlet tower.

A method of proportioning concrete, W. B. HUNTER (*Engin. News, 69 (1913), No. 19, pp. 956-958, figs. 3*).—The results of studies and actual tests of several methods of proportioning the ingredients of concrete are given from which the following method is adopted to insure a satisfactory quality of concrete and avoid the use of an excess of cement: Make a careful mechanical analysis of the aggregates by determining the amount of cement in excess of the voids in the fine aggregate required to make an acceptable mortar and the amount of mortar in excess of the voids in the coarse aggregate required to make an acceptable concrete. After determining the percentage of voids in the aggregates proportion the ingredients so as to fulfill these requirements.

Three sets of curves are given to aid in the use of this method.

Effect of too much water in mixing concrete (*Engin. News, 69 (1913), No. 21, p. 1063, fig. 1*).—Bending and compression tests were made by C. J. Robison at Yale University on cubes and beams of a 1 : 2 : 4 concrete, consisting of normal sand, cement, and $\frac{3}{4}$ -in trap rock. The minimum mixture contained 20 per cent of water by the weight of the cement and each subsequent mixture was increased by $2\frac{1}{2}$ per cent of water until a mixture containing $42\frac{1}{2}$ per cent of water was reached, which was of about the consistency of the average wet mixture.

The beam tests showed that keeping everything constant except the water there was a gain in strength of 126 per cent for a $27\frac{1}{2}$ per cent over a 20 per cent water content at the end of 30 days and 126 $\frac{2}{3}$ per cent at the end of 60 days. The cube tests showed a gain of 282 per cent with the $27\frac{1}{2}$ per cent water content over the $42\frac{1}{2}$ per cent at 7 days, 138 per cent at 30 days, and 90 per cent at 60 days. The tests as a whole indicate that in time a drying out will somewhat reduce the handicap of a very wet mixture.

The protection of concrete structures from alkali and other destructive agents, W. D'ROHAN (*Engin. and Contract., 39 (1913), No. 21, pp. 570, 571*).—From the results of his 3 years' experimental work in the alkali regions of

western United States and from the results of 50 years' reported use of the same method in India the author recommends the painting of concrete structures with a mixture of 2 parts boiled and 1 part raw linseed oil as a protection against alkali and other destructive agencies. Coincident with oil painting he recommends the use of highly silicious cements, and where work is constantly under water, of slag cement, as well as the employment of all precautions to insure a dense mixture. It is suggested that the oil coating, as the primary reliance for protection, be applied after the concrete is 6 months old and be renewed at least every 5 years.

Tests of grouting gravel in river beds, H. H. CARTWRIGHT (*Engin. News*, 69 (1913), No. 19, pp. 979-984, figs. 10).—This article describes extensive experiments with the process of injecting cement into sand and gravel to form concrete in place, conducted for the purpose of ascertaining the possibility of its use in river beds composed of sand and gravel deposits.

Both poor and good concrete were obtained in the experiments, varying from a cemented gravel very poorly bonded to a very hard, perfectly bonded concrete. In spite of the fact that there were noticeable defects in all the concrete this process is concluded to be a feasible method for forming hard foundation strata on which to found masonry structures, and should also prove of value in solidifying and protecting stream beds against scouring and washing.

Bending strength of yellow-pine timber, J. J. MORGAN (*Engin. Rec.*, 67 (1913), No. 22, pp. 608, 609, figs. 3).—Tables of safe loads for beams and girders of standard dimensions are given which provide for the defect in standard tables due to the fact that the standard sizes of timber are from $\frac{1}{4}$ to $\frac{1}{2}$ in. less in both depth and thickness than called for in their normal sizes.

Roads and road materials of Florida, E. H. SELLARDS, H. GUNTER, and N. H. COX (*Fla. Geol. Survey Bul.* 2, 1911, pp. 31, pls. 4).—This bulletin reports by counties on the road materials in Florida and on the progress of road building operations in that State up until the close of the year 1910. The road building materials classified according to their chemical composition are given as follows: Flint, chert, sandstone, infusorial earth, shell, crystallized and oolitic limestone, marl, clay, shale, muck, peat, lignite, bog iron ore, and pebble and rock phosphate.

Under the present system the county is the unit of road management and the county commissioners are in charge of road construction and responsible for the expenditure of road funds. Seven of the counties employ road engineers, 8 counties have issued bonds for road improvement, and several of the counties use county convicts for work on the roads.

A summary of the report from the several counties shows that at the close of 1910 the total number of miles of improved roads in Florida, exclusive of graded dirt roads, was 2,070. Of this number 611.3 miles were surfaced with marl or crushed stone; 146.1 miles with shell; 22.5 miles with gravel; 8.5 miles with brick; 0.4 mile with asphalt; and 5.2 miles with cement. Approximately 1,000 miles were surfaced with sand clay, and 277 miles were temporarily improved by the use of pine straw. The total expenditure on public roads in the 44 counties which reported was \$1,080,949.

Specifications for street roadway pavements, S. WHINERY (*New York and London*, 1913, 2. ed., rev. and enl., pp. X+160, fig. 1).—This book contains general specifications, embodying the latest approved practice for the proper construction of pavements of the several standard kinds. In addition is given a set of instructions for inspectors in charge of such construction.

Comparative statistics on cost of road construction (*Engin. and Contract.*, 39 (1913), No. 20, pp. 544-548).—A large amount of data collected by the con-

gressional committee on federal aid in the construction of post roads is given, showing the aggregate costs of average examples of various types of road construction in different States, the unit costs for excavation and broken stone, and the average cost for labor and teams.

Repair and maintenance of highways, L. I. HEWES (*U. S. Dept. Agr., Office Pub. Roads Bul. 48, pp. 71, pls. 3, figs. 13*).—This bulletin considers the repair and maintenance of highways as subjects separate from their construction, dealing principally with macadam roads of all kinds, gravel and sand-clay roads, and earth roads. In addition the maintenance and repair of various associated classes of roads, such as sand-oil, oil-gravel, brick, and concrete roads are briefly considered in connection with the major classes. Considerable data are given on resurfacing and surface treatment of roads, particularly in the region north of the Ohio and east of the Mississippi Rivers, and in some parts of England and France.

The importance is brought out of an accurate and comprehensive traffic census as a preliminary to highway improvement and a guide as to the necessary quality and quantity of material for maintenance purposes, particularly noting the work of the Massachusetts Highway Commission (*E. S. R., 28, p. 684*).

It is stated that the rapidly increasing automobile traffic on highways has of necessity modified the methods of road construction and maintenance. In this connection the action of motor trucks and automobiles upon road surfaces and the reaction of road surfaces upon automobile and motor truck tires are discussed and statistical data given, all of which indicate the destructive action on both road and vehicle. It is concluded that since the use of motor trucks for commercial purposes is rapidly increasing the final estimate of the economic advantage of using automobile trucks must include as a factor the increased cost of construction and maintenance required upon highways.

Good roads yearbook (*Official Good Roads Yearbook U. S., 1913, pp. VII+548, figs. 4*).—This book contains a large amount of information in regard to the construction, maintenance, and repair of roads and bridges and road administration as practiced in the various States.

Horse, truck, and tractor, H. N. CASSON, R. W. HUTCHINSON, Jr., and L. W. ELLIS (*Chicago, 1913, pp. XII+200, pls. 29*).—In this book are given statistical and other data which indicate the rapidly increasing expense of maintaining horse power for use on farms and in city and highway transportation. From comparative data, based on efficiency and economy in actual operation, a practical solution of cheaper power is suggested in the use of motor trucks for city and highway transportation and in the use of tractors for draft and belt work on the farm. It is pointed out, however, that owing to the small size of some jobs of hauling, the cost of mechanical power in these cases is greater than the cost of horse power so that it is necessary to keep accurate account of all operating expenses on all jobs and so to reduce them that the saving effected on large jobs will compensate the losses from the smaller jobs.

It is also brought out that the use of horse power can not as yet be entirely eliminated on average and small-sized farms owing to the fact that so far no economical and efficient small farm tractor has been put on the market. In this connection the importance is emphasized of making a careful study of local conditions and requirements so that an economical distribution of work may be made between animal and mechanical power.

The following chapters are included in this work: The Horse-Cost of Living; Motor Trucks—The New Freighters; What Motorized Highway Commerce Means to the Business World; Motor Transportation Considered in the Light of Scientific Efficiency; Why the Cause of Civilization Demands a Horseless Age; Motor Transportation Considered as an Aid to Industrial Advance;

Analysis of Expense of Motor Truck and Horse Equipment; The Invaluable Tractor; The Inevitable Tractor; What Size of Tractor? The Problem of the Small Tractor; Power-Plowing in Small Fields; The Tractor in the Corn Belt; The Tractor on the Fruit Farm; Raising Wheat with a Big Tractor; Tractors and Dry-Farming; and The Future of the Tractor.

[The traction gear] (*Gas Engine*, 15 (1913), No. 4, pp. 186, 187, fig. 1).—A tractor gear is described which is designed to draw from 2 to 6 plows and to which it is claimed practically any small stationary engine may be adapted. The gear may be obtained equipped with any particular make of engine preferred or any small stationary engine in present use on the farm may be mounted on it.

Results and measurements are given in tabular form from a series of tests on this tractor gear equipped with various engines, conducted by W. T. Magruder of the Ohio State University, and which indicate that the gear tested was of high efficiency.

The pulling power of slack belts, R. T. KENT (*Indus. Engin. and Engin. Digest*, 13 (1913), No. 5, pp. 203-207, figs. 9).—Experiments were conducted with the object of determining the relative pulling power of treated and untreated belts at different arcs of contact on the pulley and at varying tensions on the belt and to investigate the effect of varying the tension on the slack side.

The results, which are graphically presented, are in favor of the treated belts. The value of the treated belt apparently lies in the fact that the tension on the slack side of the belt may, owing to its greater coefficient of friction, be decreased to a much lower value than for the untreated belt before slip occurs. This decrease in the value of the tension on the slack side of the belt is accompanied by an increase in the length of the belt, thereby giving it a greater wrap or arc of contact on the pulley, both of which 2 factors, it is shown, tend to increase the pulling power of the treated belt over that of the untreated belt in an increasing ratio.

The indicator for steam traction engine testing, E. R. WIGGINS (*Threshermen's Rev.*, 22 (1913), No. 5, pp. 7, 8, 40, 41, figs. 3).—This article discusses several sets of tests of steam tractors using the steam engine indicator. These point to the importance of perfecting the design and operation of the steam tractor and for further development of investigations of the power required for the various draft and belt work on the farm, the power losses in gearing, and the tractive efficiency.

Calculating speeds, F. N. G. KRANICH (*Amer. Thresherman*, 15 (1913), No. 12, pp. 18, 19, figs. 2).—Two types of speed indicator are described and methods are outlined whereby one may calculate the speeds, pulley diameters, and cog wheel sizes necessary in driving different kinds of power-driven farm machinery.

Cost of pulling small trees with a traction engine, F. HUTCHINSON (*Engin. and Contract.*, 39 (1913), No. 19, p. 513).—A report is given of experimental work in tree pulling with a 45 brake h. p. gasoline-kerosene engine.

It was found that in pulling trees up to 3 in. in diameter the best method was to hitch to as many trees in a straight line as the length of a 30 ft. $\frac{3}{4}$ -in. chain would permit. In pulling trees from 4 to 8 in. in diameter a single pull was taken at each tree, with a hitch made from 3 to 5 ft. above the ground and a heavy block of wood on the ground next to the tree to act as a fulcrum. The most efficient procedure was found to consist in running the engine at full speed and to bring the tractor against the load slowly until the pulling chain became taut, then suddenly to bring the full power of the engine against the pull by means of the friction clutch.

Owing to the intermittent character of the loading only gasoline as fuel gave satisfactory results. The total average cost for pulling and removing 1,246 trees from 3 to 8 in. in diameter was 6.49 cts. per tree.

The Port Elizabeth farm tractor and plow trials (*Impl. and Mach. Rev.*, 39 (1913), No. 457, pp. 76-78, figs. 2).—The results of recent tractor and plow trials to determine the best farm tractor hauling itself and plow attached thereto and the best disk and moldboard plow suitable for direct haulage are reported.

Ten steam and internal combustion tractors were entered in the preliminary elimination trials, in which a 50 h. p. 8½ ton steam tractor of English manufacture hauling 2 4-furrow moldboard plows gave the best results by plowing 2 acres of tough land 8 in. deep in 1½ hours, using 152 lbs. of coal and 100 gal. of water. This steam tractor competed with a 56 to 60 h. p. oil tractor and a 60 h. p. oil tractor, both of American manufacture, in the final trials and again achieved the victory by plowing, with a 6-furrow moldboard plow, 2 acres of bad ground in 1½ hours, using 151 lbs. of coal and 99 gal. of water.

The fuel costs for plowing 2 acres were as follows: By the steam tractor 38½ cts., by the 56 to 60 h. p. oil tractor \$2.37½, and by the 60 h. p. oil tractor \$1.70½. The 6-furrow moldboard plow used in the trials and the 6-furrow disk plow were awarded the plow honors.

The 6-furrow disk plow can be converted into a 5- or 4-furrow plow. Each furrow turned is 9 in. wide up to 10 in. deep and by using larger diameter disks, which are provided with the plow, it is claimed a depth of 12 in. can be obtained.

Test of a centrifugal hand separator, I. REZEK and W. WINKLER (*Osterr. Molk. Ztg.*, 20 (1913), No. 8, pp. 115-118, figs. 4).—A description of the mechanical details of this cream separator is followed by the results of 17 service tests. The machine was driven by an electric motor equipped with a dynamometer to indicate the power consumed in operation.

The results indicate that under normal conditions of operation an average of only 0.12 per cent of fat remained in the skim milk. By decreasing the speed 20 per cent the quantity of fat remaining was raised to an average of 0.22 per cent. The average power required for operation was 6.77 kilogram meters per second, which amounted to 3.02 kilogram meters per second per hundred liters of milk separated per hour.

It is claimed that this separator is simply constructed, and easily and quickly taken apart, cleaned, and the parts reassembled. On the basis of the test results obtained it is classed as an efficient, durable, and economical machine.

[Rope], some knots and splices, J. M. DREW (*Irrig. Age*, 28 (1913), No. 7, pp. 212-220, figs. 82).—This article illustrates and describes several methods of making some of the knots and splices considered to be most useful to farmers and ranchmen.

A general purpose barn, L. W. CHASE (*Canad. Thresherman and Farmer*, 18 (1913), No. 5, pp. 34, 36, 37, figs. 6).—The author advocates the use on small and average-sized farms of a general purpose barn in which the horses, cattle, and young stock are housed practically as a unit with respect to each other and in which the same feedway, haymow space, litter carrier, and track may be used for all. In this connection he gives detailed plans and specifications for the construction of several different arrangements of barn.

The elements of heating and ventilation, A. M. GREENE, Jr. (*New York and London*, 1913, pp. VI+324, figs. 223).—This book gives in comprehensive form the information and data considered necessary in the proper design of heating and ventilating systems for both large and small buildings. The data are drawn from the experimental work of the author, from the previous works of other

experimenters, and from the experimental works of commercial concerns manufacturing heating and ventilating apparatus. Certain architectural and structural information is included, to be used in connection with the installation of various methods of heating and ventilating. The subject matter is presented under the following chapters: Methods of Heating and Ventilating Buildings; Amount and Condition of Air for Ventilation; Loss and Gain of Heat; Radiators, Valves, and Heat Transmission from Radiators; Methods of Calculating Heat Required for Rooms; Direct Steam Heating; Hot-water Heating; Indirect Heating; Furnace Heating; Furnaces and Boilers; District Heating; and Temperature Control and Drying by Air.

RURAL ECONOMICS.

Some profitable and unprofitable farms in New Hampshire, F. E. ROBERTSON and L. G. DODGE (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 128, pp. 3-15, fig. 1*).—This article presents the results of a detailed study of farming as found in 2 typical dairying sections of New Hampshire, the sections being selected to show something of the financial results of dairying under average conditions, both in the production of market milk and of cream for creameries. In the study of 428 farms there appeared a wide variation in the profitability among them, which is brought out by showing the relation between some of the methods of management and profits on 100 of the most profitable farms as compared with 100 of the least profitable farms. Tables are given showing comparative area, comparative distribution of capital, distribution of receipts and expenses, number and value of live stock, and a comparison of miscellaneous factors. It is noted that the better 100 farms have an average labor income of \$830 against a minus average labor income of \$341 for 100 of the poorer farms. The better farms averaged only about 21 more acres of total area and about \$200 more total investment than the poorer farms, but more of the investment was in working capital than in real estate. The better farms are shown to have kept one-half more cows and the same number of horses; had a greater production per cow in money value; and were operated by men 8 years younger on an average than the poorer farms.

Efficient types of farming and their location, T. BRINKMANN (*Fühling's Landw. Ztg., 62 (1913), No. 6, pp. 185-213*).—This article presents an exhaustive study of different types of farm practices and endeavors to find out and show by tables and formulas the conditions under which they are capable of producing the maximum net revenue.

Tables are given showing the various items which enter into the cost of production and distribution of farm and forest products under different systems of farm management.

Agrarian matters and agrarian politics, W. WYGODZINSKI (*Agrarwesen und Agrarpolitik. Berlin and Leipzig, 1912, vols. 1, pp. 133; 2, pp. 154*).—These volumes present an economic discussion of the agricultural industry, both as to its effect upon society and as to how society is affected by it. Special consideration is given to soils and their relation to agricultural production; persons engaged in agriculture from the standpoint of the individual, locality, and society as a whole; the underlying causes of rent, how to determine it, and its relation to value; functions of capital and credit in agriculture, classified under fixed and circulating capital, and personal and real credit; agricultural labor; profits in agricultural products; and the organization of agriculture from a professional standpoint.

Land taxation, T. EICHHOLTZ (*Deut. Landw. Presse, 40 (1913), Nos. 7, pp. 73, 74; 8, pp. 83, 84*).—This article presents a discussion of the different systems

of taxation, holding that the single tax or land tax theory is thoroughly logical, with fewer scientific objections than any other system in actual operation.

[German agricultural associations and organizations necessary to meet the demands of agriculture], L. KIESSLING (*Landw. Hefte*, 1913, No. 19-20, pp. 76).—This pamphlet contains a number of articles discussing in more or less detail the organization and growth of various classes and kinds of agricultural societies, showing their purpose, history, and progress of each. Special attention is given to societies for production and distribution; organization of agricultural labor; associations for supervising seed production and dissemination; and societies dealing with various other agricultural activities. Observations are made as to the organization of such societies by localities, districts, and counties and where they are more general in character.

A successful cooperative exchange, W. H. INGLING (*Business America*, 13 (1913), No. 5, pp. 429-431).—This article outlines a plan of the farmers' business cooperation which is being successfully operated in Monmouth County, N. J., with some of the results.

The organization was incorporated in 1908 with a capital stock of \$100,000, represented by 20,000 shares of a par value of \$5 each. It is primarily a selling organization having its salesmen located in the principal cities of 20 States east of the Mississippi River. The goods of the association are shipped on f. o. b. sales only. The total shipments reported since organization amount to 10,910 cars, distributed as follows: Potatoes 4,603,962 bu., apples and pears 153,890 bu., asparagus 1,010,822 bunches, miscellaneous fruits and vegetables 41,480 packages, and fertilizers 11,145 tons. The total amount of business done is reported at more than \$4,320,000. The increase in price on potatoes alone has given the farmers an average of over \$100,000 per year.

How cooperation remade a Minnesota neighborhood, C. POE (*Prog. Farmer*, 28 (1913), No. 26, p. 745).—This article describes briefly what cooperation has meant to the farmers in and around Svea, Minn., showing how farmers have been able to organize and successfully operate a cooperative creamery, telephone company, grain elevator, stock shipping association, and insurance company. Their efforts have resulted further in a thoroughly equipped high school with agricultural and domestic science teaching; a consolidated church with resident pastor; a school library and a state teaching library; and neighborhood social meetings 3 times a month.

The road to cheaper money, H. H. HUGHES (*Farm, Stock and Home*, 29 (1913), Nos. 4, p. 150; 5, pp. 211, 212, figs. 1; 7, pp. 328, 329, figs. 2; 11, pp. 448, 450, figs. 2).—The results of a study as to the opportunities for obtaining loans with farm property as security in Iowa, Nebraska, Wisconsin, Minnesota, South Dakota, North Dakota, and Montana, obtained by addressing a questionnaire to a number of farmers as to interest rates and discounts with different kinds of security, are presented. Data were obtained as to the average value of improved land in the various communities, also as to the general demand or desirability for short-time or long-time loans. The results are shown and illustrated by tables and charts, both by States and as a whole.

It is noted that the combined average interest rate on first mortgage loans in the territory covered was 7.24 per cent, on chattel mortgage loans 9.2 per cent, and on unsecured notes 9.48 per cent. The author notes among his conclusions that farmers who are earning a reasonable rate on their invested capital may reasonably expect a cheaper rate on money than those who have not put into practice good business methods or a profitable system of farming. "When a farmer asks for a lower rate of interest because he is not making enough to pay more, the very nature of his request and the ground on which he bases it warrants the demand for a higher rate."

Land mortgage credit system in America, H. C. PRICE (*Twentieth Cent. Farmer, 1913, No. 648, pp. 5, 22*).—This article discusses briefly the necessity for agricultural credit in the United States and points out some of the fundamentals which must be considered in working out a plan upon which such credit is to be obtained.

A plan for a state land mortgage bank, which is an adaptation of the European plan, is proposed. The plan as outlined would involve the establishing of a state land mortgage bank as a state institution which in exchange for accepted mortgages on farm real estate would issue bonds of equal amount in denominations from \$25 to \$1,000, and bearing interest at from 3 to 4½ per cent, as preferred by the borrower. These bonds could be sold by the borrower, a local bank, or the state bank. The borrower would pay on his loan the same rate of interest as the bonds issued, plus ½ per cent to pay the operating expenses of the state bank and build up the reserve fund, together with the per cent or fraction of a per cent that is to apply to the amortization of the principal.

Objections which might be raised to such a plan are pointed out and discussed.

The introduction and organization of real credits in Württemberg (Württemb. Wchnbl. Landw., 1913, No. 18, Beilage, pp. 271, 272).—This article outlines in considerable detail the organization, work, and progress of the real credit systems as operated in Württemberg in supplying loans to farmers upon real property as security. It is noted that the Central Bank of the Province had such outstanding loans to the amount of 105,978,053 marks (\$25,222,775) in 1909 and 115,063,589 marks in 1911, and that from the 71 communal banks in operation in 1909 farmers had secured loans upon mortgages to the extent of 192,428,752 marks and 264,845,671 marks in 1911.

Data are given showing prevailing rates of interest charged, the period for which loans are granted, and the terms of repayment.

Agricultural statistics of Belgium in 1912 (Min. Agr. et Trav. Pub. [Belgium], Off. Rural Raps. et Communs., 1913, No. 4, pp. 183).—Reports and communications made by the Minister of Agriculture and Public Works as to results of investigations and studies in various agricultural activities in the Provinces of Belgium in 1912 are here presented.

Trade unionism, unemployment, wages, prices, and cost of living in Australia, 1891-1912, G. H. KNIBBS (*Commonwealth Bur. Census and Statis. Aust., Labor and Indus. Branch Rpt. 2, pp. 77, figs. 10*).—The main object of this report is to present in concise and convenient form the results of certain investigations concerning industrial and agricultural unions, unemployment, changes of rates of wages and hours of labor in various occupations, prices, price indexes, and cost of living by States from 1891 to 1912 inclusive.

AGRICULTURAL EDUCATION.

Fifth report of the Rural Education Conference on courses in agricultural colleges (London: Bd. Agr. and Fisheries and Bd. Ed., 1912, pp. 31).—This report deals with the considerations which should be borne in mind in the framing of courses of instruction occupying not less than two sessions at institutions devoted to the higher study of agriculture, and on the main characteristics which such courses should possess in order to render them suitable to students who intend to take up practical farming or the management of landed estates. Courses of this nature are provided in 16 institutions in England and Wales.

The conference finds it desirable that all students attending long courses for intending farmers should have received a good secondary education and have

had at least one year's practical experience and residence on a farm. Such boys should devote at least 12 consecutive months to farm work before commencing their course. The heads of colleges should prepare a list of farmers in their neighborhood who are willing to offer farm pupils the practical training required, and it might be desirable for agricultural colleges with farms in their neighborhood to provide a 12 months' practical farm course to precede the regular two years' course. The conference is of the opinion that wherever possible the elementary instruction in pure science, which must precede more advanced instruction in applied science, should be given by an agricultural scientist and should be given an agricultural bias. Should the practical experience be required for admission it might be advisable to devote the first year mainly to the subject of science, the teaching of which should be illustrated, as far as possible, by agricultural objects and should include instruction in the properties of soils, the nutrition of plants, and the elements of manuring, and at least one day a week should be devoted to such nonscientific subjects as surveying, and practical instruction on the farm. It is suggested that the efforts of the staffs should be concentrated on the thorough teaching of agriculture, including manual instruction and the use and repair of machinery, chemistry, botany, animal physiology, elementary surveying, rural economics, and simple farm bookkeeping, and that farmer-students should not be compelled to attend classes in geology, entomology, engineering, architectural drawing, etc., although they should be given the opportunity of attending classes in one or more of these subjects if they wish to do so. The minimum length of courses of this type should be two winter sessions with one summer term or three winter sessions. The normal length of a continuous course should be two years or six terms.

Very few institutions in England and Wales have an agricultural course exactly suited to the requirements of students intending to manage estates. For such students one year's experience in practical farming is also found desirable. Students not studying for a degree should for the first two years follow a similar course to that prescribed for farmer-students, but exacting a somewhat higher standard, and devote a third year to specialization. Instruction should also be given in forestry, agricultural valuations, rating and taxation, agricultural law, estate bookkeeping, building construction, and in some cases advanced surveying and leveling.

Six appendixes contain lists of witnesses, summaries of evidence, and written statements received by the committee, a summary of replies to a schedule of questions circulated by the conference, a list of agricultural colleges and departments in England and Wales, and data as to the number, percentage, and occupations of students. It is shown that of a total of 1,083 students leaving a total of 11 institutions in England and Wales in 1908-1911, 740 are farming, 116 managing estates, and 58 teaching agriculture.

Agricultural and industrial work in the schools of Hamilton County, J. F. HAINES (*Purdue Univ. Dept. Agr. Ext. Bul. 11, 1912, pp. 8, figs. 8*).—This is a brief account of young people's agricultural club work in Hamilton County, Indiana.

Boys' and girls' agricultural clubs in Massachusetts, 1913, W. R. HART (*Mass. Agr. Col., Dept. Agr. Ed. Circ. 18, 1913, pp. 4*).—A brief review is given of the development of the agricultural club work begun in Massachusetts 5 years ago, as well as plans for the future.

Manual of uniform course of study for the elementary schools of Ohio, F. W. MILLER (*Columbus, Ohio, 1912, pp. 225*).—Definite outlines, suggestions to teachers, and reference literature are given in nature study and agriculture for the elementary schools of Ohio.

[Nature study lessons] (*Cornell Rural School Leaflet*, 6 (1913), No. 5, pp. 319-350, figs. 12).—This leaflet takes up such topics as the weather, trees, wild flowers, weeds, suggestions for summer work, and making a garden.

Helps for club members (*Purdue Univ. Dept. Agr. Ext. Buls.*, 1913, No. 18, pp. 12, figs. 6; 20, pp. 8, figs. 2; 23, pp. 15, figs. 1½).—These bulletins give directions for club work, the first, prepared under the direction of C. G. Woodbury, dealing with growing tomatoes; the second, by J. G. Boyle, with growing potatoes, and the third, by Mary L. Matthews, with girls' sewing clubs.

[Oklahoma boys' and girls' junior agricultural clubs] (*Bul. Okla. Agr. and Mech. Col.*, 9 (1912), No. 37, pp. 4; 9 (1913), Nos. 47, pp. 4, fig. 1; 48, pp. 4, fig. 1; 50, pp. 4, fig. 1; 52, pp. 4, figs. 2).—These bulletins, intended for the use of the members of boys' and girls' agricultural clubs, treat of bread and cake recipes, sewing, home canning, cooking, and the plan for the 1913 contests.

[Papers on gardening], A. E. WILKINSON (*Cornell Reading Courses*, 2 (1913), Nos. 33, pp. 73-98, figs. 9; 35, pp. 101-120, figs. 9).—Following introductions by L. H. Bailey, these papers deal respectively with vegetable and flower gardens.

Soil studies, T. I. MAIRS (*Penn. State Col. Bul.*, 7 (1913), No. 2, pp. 20, figs. 7).—This lesson for the use of teachers includes an outline for the study of the soil, and a study of the composition, chemical analysis, and treatment of soils, followed by 16 soil experiments and a brief list of agricultural textbooks.

Instructions for corn club work, A. T. WIANCKO (*Purdue Univ. Dept. Agr. Ext. Leaflet* 36, pp. 4, fig. 1).—Instructions are given for growing corn.

Potato culture, W. J. and S. N. GREEN (*Agr. Col. [Ohio State Univ.], Farmers' Reading Course*, 1 (1913), No. 4, pp. 16, figs. 5).—Directions are given.

A sorghum primer for rural schools and farmers, A. H. LEIDIGH (*Agr. Ed. [Kans. Agr. Col.]*, 5 (1912), No. 3, pp. 59, figs. 16).—This bulletin is written primarily for the rural teachers of Kansas and for their pupils of the seventh and eighth grades. It comprises the following chapters, each closing with a group of review questions and some including directions for exercises: The sorghum family, a study of the plant, description of types and varieties, growing the crop, seed selection and judging seed, sorghum sirup, and broom corn and broom making.

Varieties of apples for Ohio, W. J. GREEN (*Agr. Col. [Ohio State Univ.], Farmers' Reading Course*, 1 (1912), No. 3, pp. 11, figs. 7).—A discussion of varieties, with special reference to their selection under Ohio conditions.

Orchard cover crops, W. PADDOCK (*Agr. Col. [Ohio State Univ.], Farmers' Reading Course*, 1 (1912), No. 2, pp. 12, figs. 6).—A brief statement of the beneficial effects of the use of cover crops in the orchard and notes on individual crops.

Arbor Day annual, 1913, compiled by G. M. WILEY (*Albany, N. Y.: Ed. Dept.*, 1913, pp. 56, pl. 1, figs. 44).—This annual is devoted to a study of ornamental trees and shrubbery.

An entomological collection for common schools—how to make it, J. TROOP and P. W. MASON (*Purdue Univ. Dept. Agr. Ext. Bul.*, 19, 1913, pp. 8, figs. 10).—Careful instructions are given for making, using, and protecting against enemies certain pieces of apparatus needed for making an entomological collection.

Judging eggs, A. G. PHILIPS (*Purdue Univ. Dept. Agr. Ext. Leaflet* 35, 1912, pp. 6, figs. 2).—Directions for judging eggs by score cards, submitted as the results of experience of several egg shows held at Purdue University are given.

NOTES.

Arizona University and Station.—W. H. Lawrence, formerly of the Western Washington substation, has been appointed horticulturist of the station. Stanley F. Morse, for several years engaged in commercial agriculture and in lecturing before farmers' organizations, has been appointed acting professor of agriculture during the leave of absence of Prof. Clothier. F. W. Wilson has been transferred from Phoenix to take charge of class work in animal husbandry at Tucson.

Arkansas University and Station.—Recent appointments include the following assistants: C. L. McArthur, of the Idaho Station, in pathology and bacteriology; W. S. Fields in plant pathology; and L. H. Seymour in horticulture. R. W. Wheelock has been appointed associate in extension work.

Florida University and Station.—The state appropriations for the ensuing biennium aggregate \$173,500. Of this, \$15,000 is for laboratories and farm buildings for the college of agriculture, \$20,000 for farmers' institutes and extension work, \$4,000 for a station dairy barn, \$3,000 for additional equipment for the station, and \$3,000 for publications. Appropriations were also made of \$5,000 for domestic science and women's institutes through the State College for Women at Tallahassee, \$4,000 for an industrial building for the A. and M. College for Negroes, and \$3,000 for boys' corn clubs.

Among the recent appointments are the following: F. E. Jennings, of Jacksonville, to the board of control, vice F. P. Fleming; Ira D. Odle as instructor in botany and bacteriology; J. F. Duggar, jr., as instructor in agronomy, vice R. L. King, resigned; A. C. Mason as laboratory assistant in entomology, vice U. C. Loftin, who has accepted a position with the Bureau of Entomology of this Department; and J. Matz as laboratory assistant in plant pathology. Otto F. Burger, assistant plant pathologist, has been granted leave of absence for graduate study at Harvard University. The extension work has been reorganized as an independent branch of the university, with P. H. Rolfs as director and A. P. Spencer as vice director.

Illinois University and Station.—The faculty of the college of agriculture and station will number for the coming year 133, of whom 6 are in administration, 7 in agricultural extension, 43 in agronomy, 22 in animal husbandry, 16 in dairy husbandry, 26 in horticulture, 12 in household science, and 1 in veterinary science.

The appointments of the following assistants are noted: Orland I. Ellis and George E. Gentle in soil physics; Harry C. Gilkerson, A. F. Heck, and Howard J. Snider in soil fertility; Edward H. Walworth in crop production; Charles I. Newlin in animal husbandry; William W. Yapp and E. McC. Clark in dairy husbandry; Charles B. Sayre in olericulture; and Warren R. Schoonover in soil biology. W. L. Gaines, associate in dairy husbandry; J. T. Barrett, chief assistant in botany; John Woodward, assistant in soil physics; Oran Keller, assistant in soil chemistry; and Leslie M. Wakeley, assistant in dairy husbandry, have resigned.

Kentucky University and Station.—An agricultural barbecue was held August 20 at the country estate of Johnson M. Camden near Versailles, with an estimated attendance of from fifteen to twenty-five thousand. Following an address of welcome by Mr. Camden, addresses were delivered by President Barker, of the university, and Director Kastle, of the station, reviewing the work and opportunities of their respective institutions; a discussion of agricultural cooperation by John S. Sinclair, of Wisconsin, Charles J. Brand, chief of the new Office of Markets of this Department, and E. M. Tousley, of Minnesota; agricultural credit by James C. Caldwell, of Minnesota, a member of the American commission on this subject; various forms of extension work, by Dr. Fred Mutchler and Dr. Charles J. Evans, of this Department; rural schools, by State Supervisor T. J. Coates; state aid to agriculture, by State Commissioner of Agriculture J. W. Newman; soil conservation, by Dr. C. G. Hopkins, of Illinois; and the Farmers' Union, by R. L. Barnett.

A demonstration course in the use and administration of hog-cholera serum was held at the new serum laboratory August 14, and was largely attended by veterinarians and breeders interested in this work. It is planned to give similar demonstration courses at short intervals throughout the year.

Beef cattle feeding experiments are contemplated at the station at an early date, plans being outlined at a recent meeting of station officials with the executive committee of the Beef Cattle Association of the State. L. S. Corbett, assistant animal husbandman, resigned August 1 to accept a position as professor of animal industry in the University of Maine.

Maine University.—P. A. Campbell has resigned as professor of animal industry to become manager of a large stock farm in New Hampshire. Recent appointments include Earl Jones as instructor in agronomy; Bliss S. Brown, of the University of California, as professor of horticulture vice E. F. Hitchings, who is retiring as head of the department on account of impaired health; E. N. Boland (M. S., Iowa State, 1913) as instructor in animal industry vice Victor G. Aubrey, who becomes head of the poultry department; and O. A. Jamison as assistant in dairying, vice R. W. Redman, now engaged in extension work.

Massachusetts College.—Edwin H. Forbush, of the State Board of Agriculture, has been appointed supervisor of extension courses, P. H. Elwood extension instructor in civic betterment, and A. F. McDougall, a 1913 graduate of the college, instructor in charge of an automobile outfit which is giving demonstrations from town to town of spraying, pruning, milk testing, etc. The college fair exhibit is being materially enlarged.

Michigan Station.—O. B. Winter, of the New York State Station, and A. K. Hart, a graduate of the University of Michigan, have been appointed assistant chemists, the former succeeding William C. Marti, resigned.

Mississippi College.—James C. Olson, a 1913 graduate in agricultural engineering at the Iowa College, has been appointed assistant in agricultural engineering.

Montana College and Station.—Under an act of the last legislature the state university at Missoula, the college of agriculture and mechanic arts at Bozeman, the school of mines at Butte, and the normal school at Dillon constitute since July 1 the University of Montana, the control and supervision of which is vested in the state board of education. R. W. Clark, of the department of animal industry, has resigned.

Nebraska University and Station.—Dr. F. J. Alway has resigned as professor of agricultural chemistry and chemist of the station to accept a position as head of the division of soils in the Minnesota University and Station, and has been succeeded by F. W. Upson, Ph. D., of the University of Chicago. G. C. White has resigned as adjunct professor of dairy husbandry to become professor of

dairying in the Connecticut College, vice J. M. Trueman, resigned to assume charge of the dairy department at the Nova Scotia College. R. S. Trumbull, adjunct professor of agricultural chemistry and assistant agricultural chemist, has resigned to become agricultural expert of the Santa Fe Railroad System.

New Mexico College and Station.—The new \$30,000 fireproof engineering building is being occupied. New trades courses are to be added to the curriculum. A study of soil and water conditions in the Playas Valley is being planned by the chemical department in cooperation with the United States Geological Survey and the El Paso and Southwestern Railroad Company.

The new office of editor of publications has been established, in charge of J. A. Anderson, who is also secretary to the president. R. F. Hare has been appointed vice director of the station. George Kable has been appointed assistant in irrigation engineering, vice J. B. Stoneking, resigned.

Cornell University and Station.—E. A. White, professor of floriculture in the Massachusetts College, has been appointed professor of floriculture and head of the department. Dr. A. C. Beal will continue in special charge of the investigation and experimental work in floriculture.

Miss Annette J. Warner has been appointed assistant professor of design in the department of home economics. Vern B. Stewart has been appointed assistant professor of plant pathology, in charge of nursery disease investigations.

Ohio State University and Station.—The contract has been let for the new horticulture and forestry building, which will cost \$135,000. A tract of 132 acres of farm land has recently been purchased for the university farm.

Ruth A. Wardall has resigned as head of the department of domestic science to accept a similar position in the Iowa State University. C. S. Plumb has been granted a year's leave of absence, which will be spent in Europe.

C. G. Williams, agronomist of the station, has been appointed to the state agricultural commission, in addition to Messrs. Sandles, Strode, and Price, previously noted.

Oklahoma College and Station.—A new poultry building is being erected for the use of both the college and station, and an insectary is under construction for the station. E. E. Hall has taken up work in plant breeding.

Pennsylvania College and Station.—The state appropriations for the ensuing biennium aggregate \$652,000, of which \$426,000 is for the agricultural work and \$50,000 for a home economics building. The agricultural appropriations include \$275,000 for the maintenance of the school of agriculture and station, \$20,000 for extension work in agriculture, home economics, and vocational training, \$6,000 for tobacco experiments, \$75,000 for the completion of the horticultural building, \$20,000 for a dairy barn, and \$30,000 for a stock-judging pavilion.

The increased appropriation for extension work will make it possible to hold an additional number of farmers' weeks in various parts of the State. This method of disseminating information has been found especially effective. The extension department is also making extensive educational exhibits at the county fairs. Two tents, each 30 by 81 feet, have been purchased which accommodate the live stock and other exhibits of an educational character and provide quarters for small audiences, so that short lectures may be given.

The school of agriculture and station are to issue monthly a four-page circular giving facts of interest to the farmers of the State.

The following new men have been added to the staff: Dr. F. D. Kern, of the Indiana Station, as professor of botany and botanist; W. R. Gorham as assistant professor of agricultural extension; R. U. Blasingame as instructor in agronomy; R. S. Maddox as instructor in forestry; J. R. Bechtel as assistant in horticulture; I. J. Bibby, assistant in dairy husbandry; Paul Gerlaugh and

C. W. Hickman, assistants in animal husbandry; A. R. Haas and J. B. Demaree, assistants in botany; H. R. Kraybill, assistant chemist; and Karl J. Seulke, teaching fellow in animal husbandry.

Rhode Island College and Station.—R. B. Cooley has been appointed head of the department of animal husbandry in the college and has entered upon his duties. Miss Mabel Campbell, of the Illinois Wesleyan University, has been appointed head of the home economics department, vice Miss Sarah W. Landes, resigned. Laurence S. Crosby (Harvard, 1913) has been appointed chemist in the station.

South Carolina College and Station.—F. J. Crider, of the North Carolina College, has been appointed associate professor of horticulture and associate horticulturist. J. N. Hook, secretary and librarian of the station since its organization, died August 26.

Washington College and Station.—Recent additions to the staff include Charles A. Magoon as associate professor of botany in the college and assistant bacteriologist in the station; Horace Woolman assistant plant pathologist in the station; and Charles K. McWilliams, formerly of Stanford University, assistant chemist in the station, vice W. L. Hadlock, whose resignation has been previously noted.

Wisconsin University and Station.—Dr. S. M. Babcock has retired after 25 years' active service, becoming professor emeritus. Andrew W. Hopkins, editor of the *Wisconsin Farmer*, has been appointed agricultural editor and professor of agricultural journalism.

Wyoming University and Station.—New appointments include C. J. Oviatt as extension professor of agriculture and state leader in farm management and demonstration; A. E. Bowman of the Utah College as extension professor of agriculture and assistant state leader; and S. K. Loy as professor of agricultural chemistry as well as research chemist.

Agriculture at the National Education Association.—At the annual meeting of the National Education Association, held at Salt Lake City July 7 to 11, considerable attention was given to agricultural education and school gardens.

Agriculture Within Schools was the principal theme discussed at the opening session of the department of rural and agricultural education, held jointly with the American Nature-Study Society and the School Garden Association of America. Josiah Main, agricultural instructor in the Western Kansas State Normal School, took as his topic *How the Adoption of a Course of Study in Agriculture and Related Subjects Would Help the Public Schools*. He pointed out that the preparatory and cultural value of agriculture as a high-school subject is being unnecessarily handicapped by the bewildering diversity shown in agricultural courses of study. He claimed that the utilitarian value may be as easily secured by conforming to a course of study uniform throughout the country as by permitting each school to make a random course, and that such uniformity would make possible a standardization that would eliminate freak specialties and unbalanced courses. In addition he advocated the compilation of a comprehensive set of agricultural texts of high-school grade, each devoted to a single topic, and conforming to specifications furnished by experts of the association. From such approved texts, published in bulletin form, each school might, by arranging them in a seasonal order, including all of the prescribed subjects and electing others to suit local or state requirements, build up a standard course of study.

J. H. Paul, of the Utah State Normal School, having for his topic *In What Way Can the Nature-Study Movement Be of Assistance to Agricultural Teaching and Social-Center Work for Rural Communities*, presented reasons for making a study of the forest and shade trees a part of the regular school

work. E. C. Bishop, of the Iowa College, reported for the committee on courses of study in agriculture. Among the features especially considered were a uniform course of study, development of project work, home and school gardening, farm management, farm mechanics, agricultural booklets, community surveys, boys' and girls' clubs, preparation of teachers, use of the textbook, the made-up text and theme book, and personal, home, and community hygiene.

The department of rural and agricultural education held a joint session with the department of normal schools, at which points relative to the conduct and management of these institutions and the aid they can be to each other were discussed. The discussion on What Ought to be Done in Rural Education, Social-Center Work, etc., in the Country School and in Rural Communities was led by W. J. Hawkins, of the Warrensburg (Mo.) Normal School. Prof. Hawkins believed that teachers in rural schools should be able to adapt themselves to local conditions, and that agriculture in the normal school should be so coordinated as to allow any pupil to elect agriculture for its general benefits. D. W. Hays, president of the state normal school at Peru, Nebr., read a paper on What the Normal School Can Do and Ought to Do With the Training of Teachers for Rural Communities, advocating that particular attention be paid to those students who intend to teach in rural districts.

At the first session of the School Garden Association of America the present status of the work in the United States was discussed by L. R. Alderman, of Portland, Oreg.; Louise Klein Miller, of Cleveland, Ohio; and United States Commissioner of Education Claxton. Instances where it is particularly progressive were cited, as well as the obstacles which lie in the path of its development. The speakers agreed that this work has spread rapidly and is now being pushed in all sections of the country with great diligence, and prophesied that within a reasonable time it will become one of the important features of the daily school curriculum. At another session Miss Alice Joyce outlined school garden work in Oregon and more especially in Portland, where an interesting feature is a juvenile market, open daily, to which children may bring vegetables from the gardens; cakes, bread, or jelly they have made; fruit they have picked; and even pets they have raised or wish to dispose of.

A. Kennedy, of Weyburn, Saskatchewan, spoke on The Rural School Gardens. Three plans of financing have been tried in Canada. The first was the establishing of the Macdonald rural school fund in 1903. So long as this fund was available the movement prospered, but it ceased as soon as the fund was withdrawn. The second plan consisted of grants by the provincial governments to school districts, or bonuses to teachers, but this point of attack is failing because it arouses only an artificial interest. The third plan is to appeal directly to the people for assistance through the usual school taxes. In this way it is possible to interest all of the people and have them realize that school gardening is essentially educational.

C. A. Duniway, president of the University of Wyoming, presided over a meeting of the department of higher education, at which a paper on Relation of the Agricultural College to the State Normal School was presented by Ashley Van Storm, of the University of Minnesota. President Hamilton, of the Montana College; President Kerr, of the Oregon College; Prof. Merrill, of the Utah College; and C. H. Lane, of this Department, participated in the ensuing discussion.

ADDITIONAL COPIES of this publication
may be procured from the SUPERINTEND-
ENT OF DOCUMENTS, Government Printing
Office, Washington, D. C., at 15 cents per copy

Subscription price, per volume of 9 numbers, \$1



EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director*.
Assistant Editor: H. L. KNIGHT.

EDITORIAL DEPARTMENTS.

Agricultural Chemistry and Agrotechny—L. W. FETZER, Ph. D., M. D.
Meteorology, Soils, and Fertilizers—W. H. BEAL.
Agricultural Botany, Bacteriology, and Vegetable Pathology { W. H. EVANS, Ph. D.
W. E. BOYD.
Field Crops { J. I. SCHULTE.
G. M. TUCKER, Ph. D.
Horticulture and Forestry—E. J. GLASSON.
Foods and Human Nutrition { C. F. LANGWORTHY, Ph. D., D. Sc.
H. L. LANG.
Zootechny, Dairying, and Dairy Farming—H. WEBSTER.
Economic Zoology and Entomology—W. A. HOOKER, D. V. M.
Veterinary Medicine { W. A. HOOKER.
L. W. FETZER.
Rural Engineering—R. TRULLINGER.
Rural Economics—B. B. HARE.
Agricultural Education—C. H. LANE.
Indexes—M. D. MOORE.

LIBRARY
NEW YORK
BOTANICAL
GARDEN

CONTENTS OF VOL. XXIX, NO. 5.

Editorial notes:	Page.
The administrative management of the modern station.....	401
The moral of twenty-five years.....	404
The essentials of research.....	406
Recent work in agricultural science.....	408
Notes.....	497

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Progress made in the field of agricultural chemistry, Stutzer.....	408
Colloid chemistry and agricultural chemistry, Wiegner.....	408
Handbook of biochemical methods, edited by Abderhalden.....	408
The physical chemistry of the proteins, Robertson, trans. by Wyncken.....	408
Do gliadin and zein yield lysin on hydrolysis? Osborne and Leavenworth....	408
The influence of heat and chemicals on the starch grain, Kraemer.....	409
Sugar formation in the stalks of maize and sugar sorghum, Heckel.....	409
New method for determining potassium titrametrically in fertilizers, Schmitz..	409
Soluble silicic acid in Thomas slag and estimation of phosphoric acid, Popp....	409
Determining the citric acid-soluble phosphoric acid in Thomas powder, Popp..	410
Determining citric acid-soluble phosphoric acid in slag, Fuchs and Wagner....	410
Technical caseins, their examination and judgment, Höpfner and Burmeister..	411
An improvement of the method for the determination of galactan, Miyake.....	411
Estimation of methyl alcohol in ethyl alcohol and in alcoholic drinks, Bono....	411
Estimation of amino acids in plants by the formaldehyde method, Bailly.....	411
Progress in the chemistry of food and condiments during 1911, Kutteneuler..	412
Swiss food book.....	412

	Page.
A new method for determining sugar in potatoes, Claassen.....	412
Coloration of reagents by cow's milk in presence of hydrogen peroxid, Nicolas..	412
Modifications of the Robin process for butter analysis, Marion.....	413
On available sugar and a system of control in the boiling house, Deerr...	413
Chemical technology of fats, oils, waxes, etc., Stiepel.....	413
Oils and fats of vegetable origin produced in British India, Hooper.....	413
The hydrogenation of oils, Ellis.....	413
Progress made in the field of tobacco chemistry, Kissling.....	413
The preparation of potato flakes, Parow.....	414
Wine making, Ventre.....	414
Influence of clarification on chemical composition of wines, von der Heide....	414
Reports of school for wine manufacture and fruit culture at Klosterneuburg....	414
Utilization of the solid residue of grapes, De Saporta.....	414
The manufacture of alcohol from the nipa palm in the Philippines, Cavel.....	414

METEOROLOGY—WATER.

Crop safety on mountain slopes, Alter.....	414
Some useful weather proverbs, Humphreys.....	414
The commercial weather map of the United States Weather Bureau, Heiskell..	414
Meteorological observations at Massachusetts Station, Ostrander et al.....	415
Climatic data, Schollander and Whitcomb.....	415
The climate of San Francisco, McAdie.....	415
The rivers and floods of the Sacramento and San Joaquin watersheds, Taylor..	415
Salton Sea water, Vinson and Catlin.....	415
Close proximity of black alkali and calcium sulphate waters, Vinson and Catlin..	415
Sterilization of water by ultraviolet light, Davies.....	415

SOILS—FERTILIZERS.

The question of the origin of the loess, Merzbacher.....	415
Distribution of humus in California soils, Loughridge.....	415
The soils and other surface residual materials of Florida, Sellards.....	416
The soils of Mississippi, Logan.....	416
Truck soils of the Atlantic coast region, Bonsteel.....	416
Investigations on soil fertility in Texas, Fraps.....	416
Soil tests, Goldsmith.....	416
Observations on agricultural soils of southern Italian Somaliland, Principi.....	416
The influence of soil variation on crop production, Wilder.....	416
The soil water as affected by cultivation and manuring, Harrison et al.....	416
Effects of cultivation and manures on the experiment fields, Harrison et al....	417
Observations on soil inoculation, Lipman.....	417
Influence of humus as well as carbon dioxid fertilizing on plants, Hiltner.....	417
Fixation of nitrogen by alumina and carbon, Tucker and Read.....	417
Air nitrate, Brion.....	417
Phosphorus in turnips as influenced by amount available, Hartwell.....	417
Observations on bone meal as a phosphatic fertilizer, Schulze.....	418
An available type of raw phosphate, Iakushkin.....	418
Preparation of superphosphate with waste sulphuric acid, Kochetkov.....	418
Utilization of sodium bisulphate for preparation of phosphates, Kochetkov....	418
Preparation of double superphosphate with sodium bisulphate, Kochetkov....	418
Action of iron sulphid and phosphorite, Gal'tsev and Iakushkin.....	419
Possible sources of potash in the United States, Cameron.....	419
Effect of sodium manuring on composition of plants, Hartwell and Wessels....	419
Inspection of commercial fertilizers, Mumford and Trowbridge.....	420
Analyses of licensed commercial fertilizers, 1913, Woll.....	420
Manures and feeding stuffs: Compensation under the Scotch acts, Milne.....	420

AGRICULTURAL BOTANY.

The living plant, Ganong.....	420
The cause of growth in plants, II, Borowikow.....	420
Influence of different substances on germination and plant growth, Bokorny..	420
Frost and light as factors in seed germination, Kinzel.....	420
Influence of endosperm on the development of the embryo, Dubard and Urbain..	420
Formation of anthocyan pigments of plants.—IV, The chromogens, Keeble et al..	420

	Page.
Formation of anthocyan pigments.—V, Chromogens of white flowers, Jones	421
Studies of irritability in plants.—III, Formative influence of light, Peirce	421
Replacement of zinc by uranium in cultures for <i>Aspergillus niger</i> , Lepierre	422
Some relations between salt plants and salt spots, Cannon	422
Town smoke and plant growth, Crowther	422
The use of the manometer in sap movement, Reinders	422
Structure and life history of bacteria, Benecke	422
Report of the imperial agricultural bacteriologist, Hutchinson	422
Studies with sterile cultures of higher plants, Schulow	423
The prevalence of <i>Bacillus radicola</i> in soil, Kellerman and Leonard	423
Correlation studies of some hybrids, Tammes	424
A striking correlation in the peach, Hedrick	424
Is the biennial habit of <i>Oenothera</i> races constant? Atkinson	424
Seeds and plants imported from January 1 to March 31, 1912: Inventory No. 30.	424

FIELD CROPS.

[Experiments in field crops], Schollander	424
New work in dry farming, McOmie	426
Irrigation, cultivation, and drainage experiments, Krüger	426
Field experiments, 1911	427
Report on cooperative variety tests, 1911, Bolin	427
Reclamation of sand areas, Macpherson	427
Grass investigations in the Ozark upland, Miller and Hutchison	427
Some new grasses for the South, Oakley	428
Grasses at Rualfura, Green	428
Cultivation of forage plants, Misson	428
Cereal experiments in the Texas Panhandle, Ross and Leidigh	428
The chemical composition of atavistic beets, Urban	430
Cotton, Scherffius	430
Improved methods of handling and marketing cotton, Brand	430
Cotton growing in Egypt, Schmidt	431
Cotton growing in India, Schmidt	431
Flax experiments at Dooriah during the year 1911-12, Vandekerckhove	431
The culture of lupines and mustard, Dumont	431
On the growth of orchard grass and tall oat grass, Lindhard	431
Influence of hilling on the yield of potatoes, Dumont	431
Experiments with root crops, Helweg	431
Cooperative tests with soy beans in 1912, Williams and Welton	432
Sugar beet culture in England, Halstead	432
Sugar beet investigation in the Cape Province, Juritz	432
The world's cane-sugar industry, past and present, Prinsen Geerligs	432
Wheat experiments on the botanical areas, Cawnpore, Leake and Prasad	433
Mutation in a variety of pure-bred wheat, Passerini	433
Asepticizing pure seeds, Arcichovsky	433
Danish seed control, 1911-12, Dorph-Petersen	433
A new weed exterminator, Arthur	433

HORTICULTURE.

Hybridization experiments with stocks, peas, and beans, von Tschermak	433
The chemistry of the floral pigments, Keegan	434
Recent investigations on Brassica grafts, Daniel	434
Hybridization experiments with peppers, Griffon and Pichenaud	434
Tomato investigations, Boyle and Abbott	434
The effect of fertilizers on variation in corn and beans, Shaw	435
The California vegetables in garden and field, Wickson	435
Lists of publications on vegetable topics, Greiner	436
Differences in varieties of fruit and truck crops as to disease, Norton	436
Disease susceptibility of apple varieties in Ohio, Selby	436
Spraying: New methods, materials, and ideas, Watkins	436
Promising new fruits, Taylor and Gould	436
The precooling of fruit, Cooper	436
[The lateral shoot-forming tendency of various fruit trees], Schindler	436
On the root development of fruit trees, Kroemer	437
Investigations on the germination of pollen of fruit trees, Manaresi	437

	Page.
The frost resistance of apricot and peach pollen, Ewert.....	437
Factors influencing the formation of fruit buds in apple trees, Pickett.....	437
The fertilization of apple orchards, Stewart.....	437
Cost of producing apples, Case.....	439
Strawberries, Oskamp.....	439
The function of grape foliage in relation to the grapes, Marescalchi.....	439
The Valencia raisin industry.....	439
Statistics on the production of grapes and olives in 1912.....	439
Selection among cultivated crops with special reference to coffee, Kuijper....	439
The cost of making copra.....	439
Commercial studies with the date, Vinson and Catlin.....	439
The rapid curing of lemons, Snodgrass.....	440
The California lemon industry, Powell and Wallschlaeger.....	440
Note on the tea box industry in Assam, Pearson.....	440
Plant introduction and acclimatization, Thornber.....	440
New Garden plants of the year 1912.....	441
Dahlias, Gordon.....	441
Success in gardening, Frothingham.....	441

FORESTRY.

American forest trees, Gibson, edited by Maxwell.....	441
The forests of Prince George's County, Besley.....	441
The trees and shrubs of Oklahoma, Shannon.....	441
Individual selection with forest trees.—I, <i>Pinus sylvestris</i> , Zederbauer.....	441
Individual selection with forest trees.—II, <i>Pinus austriaca</i> , Zederbauer.....	442
On the biology of Siberian pine (<i>Pinus sibirica</i>), Pole.....	442
Periodic phenomena of pine reproduction on polar forest border, Renvall.....	442
The strength of long-seasoned Douglas fir and redwood, Alvarez.....	442
Volume table for redwood, compiled by Elam.....	442
The physiological atavism of our oaks and beeches, Magnus.....	442
Note on gumhár (<i>Gmelina arborea</i>), Rodger.....	443
Note on bija sal or vengai (<i>Pterocarpus marsupium</i>), Rodger.....	443
Note on sain or saj (<i>Terminalia tomentosa</i>), Rodger.....	443
Note on benteak or nana wood (<i>Lagerstræmia lanceolata</i>), Rodger.....	443
Note on sandan (<i>Ougeinia dalbergioides</i>), Rodger.....	443
Note on dhaura or bakli (<i>Anogeissus latifolia</i>), Rodger.....	443
The drought of 1907 and 1908 and the sal forests, Troup.....	443
A note on the blue gum plantations of the Nilgiris, Troup.....	443
A fence post test, Krauss.....	443
Work with guayule, Thornber.....	443
The aging and conservation of wood.—Insulated wood, De Kegel.....	444
National Forest timber for the small operator, Greeley.....	444
Seed collection on a large scale, Farquhar.....	444
Experiments on the influence of fertilizers in the nursery, Cuif.....	444
Forest statistics.....	444
Forest administration in Western and Eastern Circles, 1911–12, Osmaston et al..	444
Report of forest circles in the Bombay Presidency, 1911–12.....	444
Report on forest administration in Burma for the year 1911–12, Hauxwell et al..	444

DISEASES OF PLANTS.

Studies on the Fusarium problem, Wollenweber.....	444
Systematic position of <i>Fusarium nivale</i> as regards its fruit form, Schaffnit.....	445
Concerning the sclerotia of Monilia, Voges.....	445
Recent literature on fungus diseases of plants, Pammel.....	445
Diseases of plants in Iowa for 1912, Pammel.....	445
Report of the imperial mycologist, Butler.....	445
Parasitic injury to winter grains, Störmer and Kleine.....	446
Abnormal barley ears, Molz.....	446
Injuries noted to clover and rye, Hiltner.....	446
Appearance of clover canker, Störmer.....	447
The rice crop failure in Madion in 1910, van der Elst.....	447
<i>Septoria pisi</i> in relation to pea blight, Melhus.....	447
Studies on bacterial disease of peanut, De Jong.....	448
The nomenclature of the organism causing corky or powdery scab, Pethybridge.	448
Powdery scab of potatoes, <i>Spongospora subterranea</i> , Güssow.....	448

Page.

Powdery scab of potatoes in the United States, Morse.....	448
Wart disease of potatoes, Malthouse.....	448
Report on the prevalence of wart disease in Shropshire, 1912, Rylance.....	449
Some successful inoculations with the peach crown gall organism, Smith.....	449
The migration of <i>Bacillus amylovorus</i> in the host tissues, Bachmann.....	449
Combating <i>Peronospora</i> on the basis of recent investigations, Gerneck.....	449
A rot of grapes caused by <i>Cryptosporrella viticola</i> , Gregory.....	450
A new <i>Exobasidium</i> disease of the tea plant, Ito and Sawada.....	450
Diseases of the sweet pea, Taubenhaus and Manns.....	450
Notes on some western <i>Uredineæ</i> which attack forest trees, II, Hedgcock.....	450
The chestnut bark disease, Metcalf.....	451
The spotting of plantation Para rubber, Bancroft.....	451
A new wood-destroying fungus, Ames.....	451
Notes on the wetting power of fungicides, Vermorel and Dantony.....	451

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Our meadow larks in relation to agriculture, Beal.....	452
Relation of birds to grain aphids, McAtee.....	452
Entomology, Morrill.....	453
[Notes on Philippine insects], Jones.....	453
Insects injurious to the onion crop, Chittenden.....	453
Some important insect enemies of live stock in the United States, Bishopp.....	454
A new fruit and truck crop pest (<i>Irbisia brachycerus</i>), Vosler.....	454
The aphids on mangolds and allied plants, Theobald.....	454
The walnut mealy bug (<i>Pseudococcus bakeri</i>), Vaile.....	454
The yerba santa mealy bug (<i>Pseudococcus yerba-santa</i> n. sp.), Essig.....	455
The striped beet caterpillar (<i>Mamestra trifolii</i>), Marsh.....	455
The spotted beet webworm (<i>Hymenia perspectalis</i>), Chittenden.....	455
Notes on cotton moths, Dyar.....	456
Maize pests, Jones.....	456
The codling moth and one spraying in the Hudson Valley, Felt.....	456
Life histories of Syrphidæ, Part V, Metcalf.....	456
The life history of a bee fly (<i>Spogostylum anale</i>), Shelford.....	456
Some earlier observations on the habits of <i>Aphiochæta juli</i> , Knab.....	457
Dissemination of the leprosy bacillus by the house fly, Lebœuf.....	457
<i>Stomoxys calcitrans</i> , Part II, Brain.....	457
Biological studies of the pomace fly (<i>Drosophila ampelophila</i>), Guyénot.....	457
The mango bark borer (<i>Plocæderus ruficornis</i>), Jones.....	457
The passing of the hickory nut? Bird.....	457
The cigarette beetle (<i>Lasioderma serricorne</i>) in the Philippine Islands, Jones.....	458
A wild host plant of the boll weevil in Arizona, Cook.....	458
Bee keeping in Tennessee, Bentley.....	458
A revision of the North American species of <i>Megastigmus</i> , Crosby.....	458
A new hymenopterous parasite on <i>Aspidiotus perniciosus</i> , Tower.....	459
Use of flour paste in lime-sulphur solutions in control of red spider, Neüls.....	459
Suggestions on preparation and use of spray formulas, Bentley.....	459

FOODS—HUMAN NUTRITION.

Changing oils into fats.....	459
Plant fats, Thomae.....	459
Sugar and its value as food, Abel.....	459
The sterilization of confiscated meat from tuberculous animals.....	460
Detecting an excess of added water in goods made from chopped meat, Feder.....	460
Investigation of Louisiana rice with reference to beri-beri, Wellman et al.....	460
Beri-beri and freshly decorticated rice, Fargier.....	460
[Rice and] beri-beri in Tonkin, Gouzien.....	460
Soluble nitrogenous matter and the valuation of flours, Rousseaux and Sirot.....	460
Poisonous properties of khadi-ferment [used in bread making], Burt-Davy.....	460
A recent analysis of asparagus.....	461
Fungus flora of South Africa [edible fungi], Evans.....	461
[The chayote (<i>Sechium edule</i>) and maranko (<i>Lagenaria vulgaris</i>)], Burt-Davy.....	461
Constituents of apples, Thomae.....	461
Popularity of banana food products, Barrett.....	461
Ripening bananas with the respiration calorimeter, Langworthy and Milner.....	462
The chemical composition of Florida oranges, Henry.....	462

	Page.
Raisins, figs, and other dried fruits and their use, Langworthy.....	462
Ground cinnamon and cassia, McGill.....	462
Ground cloves, McGill.....	462
Ground white pepper, McGill.....	463
The nature of tea infusions, Smith.....	463
The nature of tea infusions.....	463
Food substances.—Accessories to human food, Hooper.....	463
Report of dairy and food commissioner of Michigan for 1912, Dame.....	463
[Food analyses], Hortvet.....	463
Nutritional importance of minute amounts of accessory substances, Cooper.....	463
Beri-beri—further facts concerning the vitamin-fraction from yeast, Funk.....	463
The righting of certain errors concerning normal nutrition, Gautier.....	463
Foods and food values, with suggestions to reduce cost of living, Dame et al.....	463
Basic dietary ration tables and waste accounting system, Pitcher.....	463
Report on the diet of the laboring classes in Glasgow, Lindsay.....	464
[Menus for family meals], Senn.....	464
Menus for boys from 14 to 16 years old.....	464
Remarks on the food requirements of children, Watson.....	464
Importance of suitable meals and dietary in higher education, Mumford.....	464
Malnutrition in school children—a clinical report, Wyatt.....	465
Report of Missouri Home Makers' Conference Association, 1913.....	465
Proceedings of the Middle Tennessee Home-Makers' Association, 1911.....	465
Proceedings of the Middle Tennessee Home-Makers' Association, 1912.....	465
On the absorption of nitrogenous products, Folin and Denis.....	465
On the tyrosin content of proteins, Folin and Denis.....	465
Mechanism of action of fats on pancreatic secretion, Babkin and Ishikawa.....	465
The periodic work of the digestive tract, Babkin and Ishikawa.....	465
The origin of muscular energy: Thermodynamic or chemodynamic? Macallum.....	466
Chemical changes in the nerve fiber during passage of nerve impulse, Tashiro.....	466

ANIMAL PRODUCTION.

Detailed reports on scientific work, Davenport.....	466
Heredity and inbreeding, Feige.....	466
Unsound Mendelian developments, presence and absence theory, Wilson.....	466
Interalternative as opposed to coupled Mendelian factors, Wilson.....	466
The bacterial flora of the large intestine of the horse, Choukévitch.....	466
The microbial flora of the large intestine of cattle and sheep, Choukévitch.....	466
New feeds and their value for agriculture, Honcamp.....	466
Feeding stuffs.....	467
Composition of some common fodders, Ramsay.....	467
Concentrated commercial feeding stuffs, Dame.....	467
Commercial feeding stuffs, Hortvet.....	467
Commercial feeds, MacNider and Thornton.....	467
[Roborin stock feed], Hauptmann.....	467
[Live stock in Alberta], Richardson.....	467
Animal husbandry, Wilson.....	467
Live stock experiments.....	468
[On the breeds of cattle].....	468
The cattle of Muansa and Tabora provinces, Schaele.....	468
Controlling sex in calves, Woods.....	468
Domestic sheep and their wild ancestors.—I, Mouflon and Urial types, Ewart.....	469
Species of wild sheep and their distribution, Kowarzik.....	469
The Corriedale [sheep], Camden.....	469
The production of early mutton, Macneilage.....	469
Sheep husbandry for Louisiana, Dalrymple.....	469
Dressing and skinning sheep.....	469
The searing iron v. the knife for detailing lambs, Mathews et al.....	470
Inheritance of mammae in Duroc Jersey swine, Wentworth.....	470
Swine-feeding experiments with malt sprouts v. skim milk, Klein.....	470
Pastures for hogs, King.....	471
Pig insurance clubs in 1911.....	471
[The cavalry horse], Allen, Belmont, Roe, et al.....	471
Judging draught horses.—A Canadian opinion, Smith.....	471
Government certification of stallions, Robertson.....	471
Report of the poultry superintendent, Foley.....	471
Modern breeds of poultry, Pettipfer.....	471

	Page.
The presence of the barred plumage pattern in the White Leghorn, Hadley...	471
Breeding for egg production, Purvis.....	472
Egg-laying competitions at Hawkesbury Agricultural College, Thompson.....	472
Methods of fattening, dressing, and marketing poultry, Mitchell.....	472
How the produce dealer may improve the quality of poultry and eggs, Pierce..	472
Handling dressed poultry a thousand miles from the market, Pennington.....	472
Raising guinea pigs, Lantz.....	472

DAIRY FARMING—DAIRYING.

Dairying and its relation to agriculture in semiarid sections, Risser.....	473
[Report of the dairy commissioner of North Dakota for 1912], Flint.....	473
Progress and prospects of dairying in Virginia, Howard.....	473
The management of a dairy farm, Drysdale.....	473
Winter feeding of dairy cows, Grant.....	473
Soiling and summer silage, Daniels.....	473
Relation between form and function in the milch cow, Van der Feen-Müller..	473
Relation between live weight and performance in the dairy cow, Peters.....	473
Developing dairy Shorthorns, Simpson.....	473
The production of sanitary milk by our present milk producers, North.....	473
The milk supply of New York City, Lederle and Raynor.....	473
The financial stimulus in city milk production, Harding and Brew.....	473
The price control factor in the pure milk problem, Hall.....	474
The pollution of the air in commercial dairy byres, Hendrick.....	474
Character of water for the creamery, Daire.....	474
Composition of first-drawn and last-drawn milk, Gilchrist.....	474
Contribution on the different forms of lactic ferment, Gorini.....	475
The butter tests for 1912, Evans.....	475
Feeding potatoes for cheese production], Loomis.....	475
The manufacture of Cheddar cheese, Agrostis.....	475
Manufacture of Cheddar cheese from pasteurized milk, Sammis and Bruhn....	475
Tätté, the fermented milk of Scandinavia, Freund.....	475
Intoxicating alcohol of milk, Groud.....	475
Manufacture of milk powder from various preserved milks, Hittcher.....	475
Condensed and desiccated milk, Wells.....	476
Dry milk preparation, Kühl.....	476

VETERINARY MEDICINE.

A system of veterinary medicine, edited by Hoare.....	476
The animal doctor, Leeney.....	476
Second report of the director of veterinary research.....	476
The weight of the lungs of mammals, Magnan.....	476
The nonoperative methods of treating malignant growths, Werner.....	476
Biological method for diagnosing pregnancy, Frank and Heimann.....	476
Use of antitryptic power of blood serum for diagnosis, Berrár and Raitsits....	477
Primary serum toxicity, Boerr and Weinfurter.....	477
Cotton-seed meal toxicity.—II, Iron as an antidote, Withers, Brewster, et al..	477
Examination of milk from newly lactating animals for its enzym content, Gruber	477
Anaplasms or Jolly bodies? Dodd.....	478
Photomicrographs of spirochetæ, entamebæ, plasmodia, trypanosomes, etc....	478
Encephalic embolic strongylosis or encranial strongylgenic embolism, Law ...	478
Studies of the bacillus of Schmorl.—III, Experiments on the rabbit, Césari..	478
Clarifying open questions with reference to anthrax, Burow.....	478
Etiology of recurrent fever; its transmission by the louse, Nicolle et al.....	479
Trypanosomes <i>v.</i> heat center and anaphylatoxin fever in rabbits, Hirsch.....	479
<i>Trypanosoma equiperdum</i> in Russia in Europe, Belitzer et al.....	479
The virulence of old (inactive) tuberculous foci in bovines, Uhlenbrök.....	479
The significance of bovine tubercle bacilli for man, Orth.....	479
Tubercular birds as a cause of tuberculosis in pigs, Bang.....	479
Contribution to the symptomatology of tuberculosis in the horse, Augustin....	479
Detection of tubercle bacilli in the circulating blood, Mammen.....	480
Value of the alcohol test for detecting milk of diseased animals, Metzger.....	480
The action of tuberculin on the nontubercular guinea pig, Klopstock.....	480
Vaccination against bovine tuberculosis with laboratory animals, Bruschettini.	480
Immunization against tuberculosis, Borissjak et al.....	481

	Page.
Some further experiences with chemotherapy in tuberculosis, Linden.....	481
Researches regarding epizootic abortion of cattle, M'Fadyean et al.....	481
Myiasis caused by <i>Chrysomya (Pycnosoma) megacephala</i> , Bouet and Roubaud..	482
[Paralysis of lambs apparently caused by <i>Dermacentor venustus</i>], Torrance.....	482
The occurrence and forms of <i>Piroplasma ovis</i> in Dalmatia, Inchiostri.....	482
Epizootic of hog cholera at Algiers, Sergeant et al.....	482
Relation of <i>Bacillus veldagsen</i> to hog cholera, Pfeiler and Kohlstock.....	482
Method of using antihog cholera serum, Baughman.....	482
The viability of certain cysticeri in pigs and in young dogs, Scott....	482
Protective vaccination against pectoral form of equine influenza, Görlitz.....	482
Protective and curative tests in pectoral form of equine influenza, Nowacki...	483
Equine piroplasmosis in the Canal Zone, Darling.....	483
Infection of dog with piroplasmosis through mucous membranes, Navrotsky..	483
<i>Toxoplasma canis</i> , Yakimoff and Kohl-Yakimoff.....	484
The parasites of the muskrat, Barker.....	484
Effects of commercial iodine compounds in fowl spirochetosis, Messerschmidt..	484

RURAL ENGINEERING.

Agricultural engineering, Davidson.....	484
Irrigation investigations, Smith and Kelton.....	484
Concrete pipe and overflow basins for distributing irrigation water, Mills.....	485
Convolution tube wells for irrigation, Brownlie.....	485
Cost of water per acre.....	486
Water resources.....	486
A preliminary report on the Quincy Valley irrigation project.....	486
Annual irrigation revenue report of Bengal for the year 1911-12.....	486
Kopjes irrigation scheme, Orange Free State, Muller.....	487
River discharge, Hoyt and Grover.....	487
Superelevation at bends on roads, Ryves.....	487
General specifications for roads and bridges, Hill.....	487
How Reclamation Service makes concrete pipe.....	487
Effect of moisture on strength of concrete: An explanation of tile failures.....	487
Control of initial setting time of Portland cement, Ware.....	488
Power transmitting capacities of pulleys, Leese.....	488
The prony brake and its use, Phillips.....	488
Effect of fatty and other oils on carbonization of lubricating oils, Waters.....	488
Machinery adopted for use on moor plantations, Åkerberg.....	488
Design and operating features of motor-driven pumps, Carpenter.....	489
[Comparisons of motor trucks and horse-drawn vehicles], Brettell.....	489
Comparison of different kinds of silos, King.....	489
The construction of silos in stone and brick, Cleghorne.....	489

RURAL ECONOMICS.

Social and economic survey of a Minnesota township, Thompson and Warber.....	489
The distribution of farm labor, Johnson.....	490
Theories of Karl Marx and land ownership, Barcia y Trelles.....	491
The settlement of irrigated lands, Scofield.....	491
State v. national control of public forests from viewpoint of a western State...	491
Agricultural credit, Wilson.....	491
The sources of rural credit and the extent of rural indebtedness, Holmes.....	491
Cost of distributing food products, King.....	492
A successful method of marketing vegetable products, Corbett.....	492
Prices of farm products—comparison with recent years, Wilson.....	493
Foreign trade in agricultural products, Wilson.....	493
Crop Reporter.....	493
Agricultural statistics.....	493

AGRICULTURAL EDUCATION.

Report of Department of Agriculture and Technical Instruction for Ireland.....	494
Agricultural education and research.....	494
Scheme of agricultural education.....	494
Agricultural education in the United States, Beaufreton.....	494
Agriculture in public high schools, Crosby.....	494
New ideals in rural schools, Betts.....	494

CONTENTS.

IX

	Page.
School gardens.....	494
A model school garden at the agricultural exposition, Paris, 1913, Vercier.....	494
Report of the work of the School Gardening Association in 1911 and 1912.....	495
Civic welfare work and landscape gardening in the city of Cleveland, Miller..	495
Garden and playground nature study, Feasey.....	495
School and home gardens, Hungate.....	495
Gardening and nature study.....	495
Mississippi canning clubs, Powell.....	495
The geological course for agricultural instructors, 1912, Jentzsch.....	495
Syllabus of home economics.....	496

MISCELLANEOUS.

Annual Reports of the Department of Agriculture, 1912.....	496
Yearbook of the Department of Agriculture, 1912.....	496
Twenty-third Annual Report of Arizona Station, 1912.....	496
Fifth Annual Report of Williston Sub-experiment Station, 1912.....	496

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

<i>Stations in the United States.</i>		<i>Stations in the United States—Contd.</i>	
	Page.		Page.
Arizona Station:		Rhode Island Station:	
Twenty-third An. Rpt. 1912..	415,	Bul. 153, Mar., 1913.....	419
426, 439, 440, 443,		Bul. 154, Apr., 1913.....	417
453, 467, 484, 496		Wisconsin Station:	
Hawaiian Sugar Planters' Station:		Circ. Inform. 44, Apr., 1913..	420
Agr. and Chem. Bul. 41, Apr.,			
1913.....	413	<i>U. S. Department of Agriculture.</i>	
Indiana Station:		Ann. Rpts., 1912.....	491, 493, 496
Bul. 164, Mar., 1913.....	439	Farmers' Bul. 525.....	472
Bul. 165, Apr., 1913.....	434	Farmers' Bul. 535.....	459
Massachusetts Station:		Yearbook, 1912.....	414, 416, 419,
Met. Buls. 293-294, May-June,		428, 430, 436, 444, 451, 452, 453, 454,	
1913.....	415	462, 472, 473, 476, 491, 492, 494, 496	
Mississippi Station:		Bureau of Animal Industry:	
Tech. Bul. 4, 1913.....	416	Bul. 165.....	475
Missouri Station:		Bureau of Entomology:	
Bul. 108, Feb., 1913.....	427	Bul. 127, pt. 1.....	455
Bul. 109, Feb., 1913.....	420	Bul. 127, pt. 2.....	455
Research Bul. 6, Feb., 1913...	490	Bureau of Plant Industry:	
New York State Station:		Bul. 282.....	424
Bul. 363, Apr., 1913.....	473, 474	Bul. 283.....	428
North Dakota Station:		Bureau of Statistics:	
Fifth An. Rpt. Williston Sub-		Crop Reporter, vol. 15, No. 6,	
sta., 1912.....	415, 424, 496	June, 1913.....	493
Ohio Station:		Weather Bureau:	
Circ. 132, Apr. 2, 1913.....	432	Bul. 43.....	415
Circ. 133, Apr. 15, 1913.....	436	Bul. 44.....	415
Pennsylvania Station:			
Bul. 121, Apr., 1913.....	437		

EXPERIMENT STATION RECORD.

VOL. XXIX.

OCTOBER, 1913.

No. 5.

The conditions developed by several of the recent changes in directorship illustrate the results of loose organization and lack of a sufficient measure of formality in the management of the experiment stations. They emphasize the difficulty and embarrassment into which a station may be thrown by the retirement or withdrawal of the director unless there has been some systematic and orderly provision for records of the various lines of activities, the plan for financing these, the development of new lines, and an outline of general policy.

The station is to be looked upon as a permanent institution. It has its own funds, and it should have a definite aim, a program, and a policy. It is composed of a group of men working, not individually, but collectively and unitedly, as an organized body. It should suffer as little shock and setback as possible by a change in directorship; and provision to guard against this should be made from day to day and from month to month, recognizing the permanence of the institution and the liability of change. Such provision is a part of good administration.

The director of an experiment station is not merely the administrative officer but he is the natural leader, and as such is the most fundamental factor in building a strong institution. His personality and viewpoint will have very much to do with the zeal and enthusiasm of the men and the general effectiveness of the station. But its strength can not rest alone upon his individuality if it is to be more than a one-man station and have permanence. A leader in any line who so organizes his enterprise that it all centers in him and carries the plan in his own mind can not be regarded as an efficient organizer, but builds only a house of cards. The whole enterprise collapses or is thrown into confusion when he steps out, and permanence and continuity are only preserved with great difficulty. It is one of the tests of a director that he builds something which will endure, develops and puts into operation a plan, establishes an ideal, disseminates an inspiration, a sentiment, and an attitude, which will remain an invaluable legacy when he has gone elsewhere. In this way

he stamps his individuality and his influence, and at the same time leaves a system which is a permanent strength.

Perhaps it is because there has been so much pressure for the immediate result, and the eyes of the men have been kept so largely on the present, that more attention has not been given to the future of the institution, and this may account for a lack of adequate records noticed too often in the administrative office; but it is faulty administration regardless of the cause, and some day the results of it may largely obliterate the good which an officer has done.

To some men system and order are naturally distasteful, and mean to them only "red tape" and a species of restriction and control which goes counter to their ideas of academic freedom. They pride themselves on not acting according to rule, and assume for themselves a freedom from formality which in the end is dangerous. If such men are placed in administrative positions they should, for their own protection, be surrounded by a system of procedure which will insure an orderly conduct of the station's affairs and provide records for the future.

The growth of the stations in available funds makes necessary a more formal plan of administration than was required when the funds were much smaller. The simple and rather free system then in practice does not meet the needs of the more complicated situation at present, with relatively large amounts of money, more diverse activities and responsibilities, and broader relationships. The desire to keep the system simple and avoid formality has in some cases prevented the organization growing with the funds and left it inadequate.

One of the first things we should expect to find in every director's office, for example, is a complete list of the activities of the station in its various departments, with estimates of their probable needs and the provision made for meeting these needs. In fact, it is difficult to see how a station can be intelligently and safely operated without such a record, or how a governing board can be satisfied to authorize lines of work and expenditures. But even at this day such a program is not infrequently lacking, as some of the recent changes have shown. It has more than once transpired that the Adams fund projects were the only activities definitely listed by the station, and there have even been cases where reference has had to be made to this Office for a list of these lines of investigation. The outlining of all work in the form of projects is becoming far more common in the better organized stations, and is found mutually advantageous to the director and specialists. It is the simplest way of keeping track of what is in progress and what needs to be provided for, and it is a convenience in planning the season's campaign, in following up the

work, and in preparing reports. Such an outline ought to be a condition of allotment of funds among departments.

The outlining of plans for experiments and investigations gives opportunity for weighing their importance and for scrutinizing the plan of individual undertakings. There is need for this. It is quite clear that if some of the experiments going on to-day had to be outlined as projects and passed upon by a discriminating director, they would not be undertaken or continued at this stage of station development, but would be turned over to the extension department; and it is equally certain that if there were a critical review or revision of lines which are going on year after year, because they have got in running order and require little attention, there would be a discontinuance or bringing to a head of many activities which are expensive of land, time, and labor, and are not in harmony with the present view or spirit of station work. Some experiments gain in value by long continuation, if carefully conducted and studied with discrimination in the light of what has gone before; but in other cases these long-continued experiments without change of plan become cumulative evidence of their inability to contribute to understanding. The latter class, instead of being entitled to the veneration of age, should long ago have given way to a search for more effective methods and more productive studies.

Much of the work in the field and the feed lot has reached a stage where it calls for critical analysis and segregation. Now that the line is being more sharply drawn between the acquisition of new knowledge and the dissemination of current information is just the time for the exercise of such discrimination—for making the station work more objective and original and purposeful, and directed at a broader understanding both of the results and of conditions.

The planning and arranging for this is an administrative problem. It calls for a definition of policy, and a weighing of the various types of work in the light of twenty-five years of experience. To a certain extent it calls for more active direction. Like the carrying out of any program, it implies some degree of restriction in the freedom of individual action. Experience has shown the importance and reasonableness of this. Especially in the case of the more immature workers, supervision and control are necessary. It is doubtful wisdom to invest a man with "academic freedom" to conduct a long and expensive series of field experiments until it is certain that he has availed himself of what others have done before him, and has developed a method of attack adapted to the case and capable of yielding results of scientific accuracy.

The economical and effective use of the funds of a station require discretion in the selection of topics to be studied, care in planning these studies, and the following up of the work as it progresses. In

these respects our station work in some instances leaves opportunity for improvement, and the administrative management lacks the strength which the present magnitude of the enterprise calls for.

In his recent presidential address before the agricultural section of the British Association, Prof. T. B. Wood, of the University of Cambridge, voiced many of the views which have often been urged in this country as to the basis of progress in agricultural investigation and its application. His address dealt in a general way with the result of the last twenty years, discussing both successes and failures as a guide to the future.

Considering the common field and plat experiments, Professor Wood argued for more painstaking methods, to reduce the probable error and make the practical recommendations more reliable and safe. In this country we have recognized the necessity of this, have bent our energies toward safeguarding the results of this type of experimenting, and as time has gone by have realized more and more its limitations. The safe interpretation of results is the crucial point in experimental work, and this refers back to the manner in which the results were obtained. Unless the conditions of the experiment are known and the variable factors controlled or checked, there can be no safe tracing of relationship between cause and effect.

Although the number of plats has been multiplied and various checks provided, many of our field experiments are still crude and far from giving results of scientific accuracy. They have served to furnish indications of practical importance, but after twenty-five years of experimenting, which has been so largely on a practical basis, it would seem that many of the practical and commercial aspects of such questions as varieties, culture, feeding, etc., should have received sufficient attention for the present, or at least have indicated the inability of the methods used to settle these questions with a degree of finality and understanding.

Our experimental work has been quite largely the development of facts and the attempt to interpret these in action—in rules or theories largely of empirical nature. To make this work virile and give it the force of understanding requires a deeper insight than is usually had into the meaning of the facts, the reasons for them, their limitations, and their consequences. It is far easier to develop a body of facts than it is to evolve from those facts a few deductions that are scientifically sound and explained in their relationships and consequences. The latter gives us a working knowledge upon which other knowledge can be built. In this way human intelligence is broadened, since “to know a thing and know you know it, that is knowledge”; and this intelligence born of understanding gives power in dealing with the composite phenomena surrounding agricultural operations.

Now that a separate department has taken over the demonstration features, the stations should give their attention to perfecting their experimental work and putting the questions of agriculture in such form that results of scientific accuracy and value will follow. Unless the methods of research in some phases of agriculture can be mastered more effectually, neither the theory nor the practice can be permanently advanced on the basis of scientific understanding.

As Professor Wood well said, "agricultural science has now reached that stage of development at which the obvious facts which can be demonstrated without considerable effort have been demonstrated, and further knowledge can only be acquired by the expenditure of continually increasing effort. In fact, the law of diminishing returns holds here as elsewhere."

Responsibility to the farmer and the need of being sure of conclusions is greater than ever, for his confidence has been won and he is in a receptive condition. As Professor Wood put it: "The chief danger seems to be that he tries new things simply because they are new, and he may be disappointed if those who are responsible for the new things in question have not taken pains to ascertain with certainty that they are not only new but good. . . . Let us therefore recognize that the farmers of the country are ready to listen to us and to try our recommendations, and let that very fact bring home to us a sense of our responsibility. All that is new is not therefore necessarily good. Before we recommend a new thing let us take pains to assure ourselves of its goodness. To do so we must find not only that the new thing produces a greater return per acre but that the increased return is worth more than it costs to produce, and we must also define the area or the type of soil to which this result is applicable."

In summing up what he terms "the moral of the last twenty years of work in agricultural science," Professor Wood says: "The many practical field and feeding tests carried out all over the country have demonstrated several very striking results, but if they are to be continued with profit more trouble must be taken to insure accuracy. Farmers are ready to listen. It behooves us more than ever to found what we tell them on accurate results. Besides such practical trials, however, much has been done in the way of individual scientific work," and he makes an argument for more work of this character, which he declares to be "of practical value to the farmer, as immediate as the most practical field trial, and of far wider application."

This is the keynote of the whole argument for research in agriculture—its practical value and its wide application. Results of the most simple trials which are not accurate or can not be safely extended to similar areas are impractical in the highest sense unless carefully

guarded. Unless the findings are accurate and represent the truth as far as they go, they are of little practical or theoretical value but are rather a stumbling block at a stage when mistakes are less excusable than formerly. Unless our work can be progressive in method and in kind it becomes itself a just and valid criticism of our institutions.

No work is of more practical or intrinsic value than that based on research related to practical agricultural questions. The difference between research and the simpler forms of experimenting is one of method and aim, and not one of subject. The immediate relation of research to practice is limited only by the skill and success of the investigator. If the experiment stops with ascertaining merely the empirical fact and without an attempt to work out the reason on which these facts rest or their limitations, it can not be regarded as a very high type of experiment and can not broaden human intelligence, which after all is the ultimate object of all our agricultural experimenting and investigating. There are distinct limits to the working out of rules for practice, to be followed unthinkingly and without consideration of many conditions. The broader understanding essential to intelligent management must rest on well-considered and well-directed research, which goes beyond the realm of human experience and attempts to add something new or a link in a chain of evidence or a new point of view.

The essentials of research were recently outlined in an address by Prof. R. D. Carmichael, published in *Science*,^a in a manner which helps to clarify this subject. "True research," he says, "consists in any one or more of three kinds of work of equal rank, as follows:

"1. Ascertaining new facts of a permanent character or drawing attention to new relations among facts already known. This requires the power to direct attention to things which other people have overlooked, to separate them from the mass of facts in which they are imbedded, and to study them first for their own sake and then in relation to other things. . . .

"2. Deriving the consequences of facts already known. No fact is thoroughly understood until all its consequences are brought into review or the possibility of doing this has been clearly and definitely recognized. Indeed it is only when this has been done that we can be said to have ascertained that the thing is a fact.

"3. Developing a body of theoretical doctrine, with or without reference to facts to be accounted for by it. Under this head come such matters as the Mendelian theory of inheritance, the electron theory, the mathematical theory of electricity, projective geometry."

As to the subject matter, he says: "Out of the myriads of facts in the universe selection must be made. Some are irrelevant; and these should be discarded. To determine the number of sprigs of grass on

^a *Science*, n. ser., 37 (1913), No. 959, pp. 738-743.

the campus or to count the lady bugs on our planet is not research. These facts—though facts they are—have no permanent character; they do not lead anywhere.” And as to the spirit of research he says: “To do effective research is to know the spirit of mastery, the spirit of mastery where no one else suffers the pang of defeat. It is to develop the sense of superiority of mind over that which is not mind. It is consciously to obey the command to subdue the earth. It is to replenish it with a new creation. It is to make the universe a little fuller and richer by understanding it better.”

Years ago the director of one of our oldest stations explained in his first annual report that “to rightfully connect cause and effect requires careful education and training of the faculties, and to interpret fully facts in their proper relations requires most considerate study.”

In the past few years a long list of efficient station workers have exemplified the meaning of research and its method, have demonstrated its spirit, and have furnished results which show more conclusively than words can the practical and the enduring value of that type of activity. The stage has been reached for its broader application to the live practical problems of agriculture. We have outgrown the more superficial methods and tentative results. It was interesting to hear the statement recently of a station director in the far West, that the most practical and valuable features of his station's activities had been the product of its Adams fund projects;—this in a country where cultivated agriculture is new and where the natural tendency would be for quick results, to answer the questions of the immediate present.

Until permanent and enduring facts are developed we can have only a shifting and uncertain foundation for a theory of practical agriculture; and until our understanding is clear and sure it is impossible to broaden the understanding and the reasoning basis of the farmer.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Progress made in the field of agricultural chemistry, A. STUTZER (*Chem. Ztg.*, 36 (1912), Nos. 89, pp. 849-851; 91, pp. 870-872).—This is a retrospect of the advance made in agricultural chemistry during the last few years. It deals with plant chemistry and physiology, fertilizers and fertilizing, and the physiology of animal nutrition.

Colloid chemistry and agricultural chemistry, G. WIEGNER (*Fühling's Landw. Ztg.*, 62 (1913), No. 1, pp. 1-22).—This is an exposition of the evolution and the theories of colloid chemistry. It deals especially with the application of colloid chemical principles to agriculture.

Handbook of biochemical methods, edited by E. ABDERHALDEN (*Handbuch der Biochemischen Arbeitsmethoden. Berlin and Vienna, 1912, vol. 6, pp. XVIII+786, pl. 1, figs. 335*).—This extensive work of which previous volumes have been noted (E. S. R., 26, p. 106) deals with the following topics: Preparation, detection, and estimation of the higher carbohydrates; physical-chemical analysis of the plant cell; use of adsorption and capillarity in biochemical analysis; detection of alkaloids; methods for determining caoutchouc; sterilization of living plants; preparation, examination, and analysis of tannins; methods for determining the intensity of light for biological purposes; biochemical methods for malaria investigations; the optical method and the dialysis method for the diagnosis of pregnancy; methods for the quantitative determination of the diastatic ferments, fibrin ferments, and fibrinogen; capillarization for substantiating micro-chemical work; methods for the detection of substances in urine; formol titration; the quantitative determination of aliphatic amino groups; chemical and biological investigation of water and sewage; some medicinal data on analysis; spectroscopic methods for determining hemoglobin and associated coloring matter; the use of the photographic method in the spectrophotometry of the blood; apparatus for the quantitative collection of urine and feces from the male bovine; supplement to the methods for examining products of digestion; new methods for studying the longevity of living tissues in vitro; making an Eck fistula in a dog; detection and determination of adrenalin in the blood; method for examining the intestines (peristalsis); and some supplementary matters in regard to general laboratory technique.

The physical chemistry of the proteins, T. B. ROBERTSON, trans. by F. A. WYNCKEN (*Die Physikalische Chemie der Proteine. Dresden, 1912, pp. XVI+447, figs. 4*).—A translation into German of a book previously reviewed (E. S. R., 22, p. 301), to which has been added a large amount of data, dealing chiefly with the individual compounds of the proteins; the electro-chemistry of the proteins, involving formation and dissociation of their compounds, conductivity of protein-salt solutions, and the electro-chemistry of protein coagulation; physical properties of protein solutions; and hydrolysis and synthesis of protein by enzymes.

Do gliadin and zein yield lysin on hydrolysis? T. B. OSBORNE and C. S. LEAVENWORTH (*Jour. Biol. Chem.*, 14 (1913), No. 5, pp. 481-487).—Lysin was

identified in a supposedly pure preparation of gliadin but no trace of it was found in zein.

The influence of heat and chemicals on the starch grain, H. KRAEMER (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 17 (1912), Sect. VIIIb, pp. 31-35*).—A study of the starch grain with particular reference to its structure and the effect of heat upon the polarization and the structure of the granule.

About the effect of removing the male or female organs, or both, upon the sugar formation in the stalks of maize and sugar sorghum, E. HECKEL (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 16, pp. 686-690; abs. in Chem. Ztg., 36 (1912), No. 66, Repert., p. 314; Österr. Ungar. Ztschr. Zucker-indus. u. Landw., 42 (1913), No. 1, p. 171*).—During 1911 and 1912 tests were conducted with maize and sugar sorghums with Stewart's method as used by Doby (*E. S. R., 24, p. 707*) for increasing the sugar content. The factor especially noted was the effect produced as a result of removing the male or female inflorescences, or both. The highest amount of saccharose was noted when both elements were removed, the maximum quantity in the stalk (11.98 per cent in maize juice and 13.7 per cent in sorghum juice) being nearly double that of the uncobbed plants.

Starch was found to be present to quite an extent in the stalks from which either the female or the male and female flowers had been taken off. The starch was noted as a sediment from the juice, and would no doubt interfere materially with the defecating and crystallizing operation if these plants are used for the manufacture of sugar commercially. The difficulties, however, may be obviated, the author believes, by leaving a plant having one female inflorescence in the vicinity of plants which have had only their female flowers removed.

Some soluble substances (dextrin) which gave a red reaction with iodine were also present in the juice.

A new method for determining potassium titrametrically in fertilizers, B. SCHMITZ (*Abs. in Chem. Ztg., 36 (1912), No. 88, p. 842*).—A detailed description is given of the method, which depends upon the reduction of the potassium platonic chlorid with alcohol in the presence of finely divided platinum. The hydrochloric acid liberated is titrated by the usual methods.

The soluble silicic acid in Thomas slag powder and its influence upon the estimation of citric acid-soluble phosphoric acid, M. POPP (*Abs. in Chem. Ztg., 36 (1912), No. 115, pp. 1102, 1103*).—It was noted that when using the methods of Böttcher (*E. S. R., 15, p. 744*) and Wagner (*E. S. R., 15, p. 645*) for citric acid-soluble phosphoric acid high results are often obtained (2 per cent and higher) for phosphoric acid. This is explained by the fact that larger or smaller amounts of silicic acid, which have been dissolved by the citric acid, are precipitated. It is shown that the soluble silicic acid in Thomas slag is then only precipitated when the slag contains a small amount of soluble iron.

On the basis of some optical tests it is shown that the silicic acid soluble in citric acid is not present in a colloidal state. It was also impossible to detect colloidal silicic acid in the acid extracts by dialysis or by ultrafiltration. On the other hand in the alkaline extracts obtained with ammonium citrate the silicic acid was in a colloidal condition.

If some ferric chlorid is added to such solutions, the silicic acid is not precipitated. No metals other than iron can keep the injurious silicic acid in solution and only then when the iron is used as an ion.

A method is proposed for determining citric acid-soluble phosphoric acid based on this principle.

A reliable method for determining the citric acid-soluble phosphoric acid in Thomas powder, M. POPP (*Chem. Ztg.*, 36 (1912), No. 99, p. 937).—The author claims that in determining the citric acid-soluble phosphoric acid in slag powder with direct methods, high results are very often obtained. Better figures can be gotten if the silicic acid is first removed with hydrochloric acid, but the procedure is a tedious one. The Lorenz method, which has been proposed, yields good results, but it is an expensive and cumbersome method. Wagner's method was also tried, but the results were unsatisfactory.

The following is considered a rapid method: To 50 cc. of the citric acid extract add 25 cc. of an iron citrate solution, 100 cc. of a 0.3 per cent hydrogen peroxid solution, and 25 cc. of magnesia mixture, and stir for 15 minutes. The method can not be used for Wolters' phosphate without some change in the procedure.

The reagents used are made as follows: (1) Iron citrate solution: One kg. of citric acid is placed in a porcelain dish and mixed with 30 gm. of iron chlorid, dissolved in 50 cc. of water; next 4 liters of 20 per cent ammonium hydroxid is added slowly and carefully, being sure that every particle is dissolved. The solution is then brought into a 5-liter bottle, cooled, and filled to the mark with water, and filtered. (2) Hydrogen peroxid solution: This is made by diluting 10 cc. of perhydrol (30 per cent) with water to make 1,000 cc., and then diluting 100 cc. of this 3 per cent solution to 1,000 cc. (3) Magnesia mixture: Five hundred and fifty gm. of magnesium chlorid and 700 gm. of ammonium chlorid are placed in 10-liter bottles containing 2 liters of water. When the salts are dissolved, 1,750 cc. of 20 per cent ammonium hydroxid solution is added, filled to the 10-liter mark with water, and filtered after a few days.

The author desires that experiment stations make some comparative tests between this and other methods, and where any concordant results are obtained with certain slags asks that a sample of the slag be sent him.

Determining the citric acid-soluble phosphoric acid in Thomas slag powder, W. FUCHS and P. WAGNER (*Chem. Ztg.*, 36 (1912), No. 110, pp. 1037-1039).—A discussion in regard to the method recommended by Popp above.

It is claimed that the authors about 10 years ago showed that slags rich in silicic acid were usually poor in iron. Thinking that either an addition of iron or aluminum would eliminate the errors noted in the analysis of such slags, they made tests showing that iron was the preferable substance to add.

Weibull (*E. S. R.*, 14, p. 630) and later others added solutions of ferric chlorid to the citric acid extract, but the authors found that by adding an amount equivalent to 0.044 gm. of iron in the shape of ferrous chlorid, better results could be obtained. The precipitation was later conducted by removing the hydrogen sulphid contained in the acid solution with 10 cc. of 0.3 per cent hydrogen peroxid, and then adding 25 cc. of ammonium citrate solution containing 0.044 gm. of iron, followed by a magnesia mixture.

The method is given below, as it is claimed that Popp did not describe the authors' method correctly.

(1) Iron containing ammonium citrate solution: Two kg. of citric acid is placed in a 10-liter bottle and covered with 100 cc. of iron chlorid solution which contains 12 gm. of iron in the ferrous form. To this is added carefully, and at intervals, about 8 liters of 20 per cent ammonium hydroxid solution, making sure that the citric acid is fully dissolved, and after cooling filled to the 10-liter mark with 20 per cent ammonia. (2) Magnesia mixture: One hundred and ten gm. of crystallized pure magnesium chlorid, and 140 gm. of ammonium chlorid are dissolved in 1,300 cc. of water, and then 700 cc. of ammonium hydroxid (8 per cent NH_3) is added. After allowing the mixture to stand for a few days, it is filtered. (3) Precipitation of the phosphoric acid: Fifty cc. of the citric acid extract of the Thomas slag is brought into a beaker glass, and

10 cc. of a 0.3 per cent hydrogen peroxid solution and 25 cc. of the iron-ammonium citrate solution are added. The mixture is then stirred at a temperature of from 15 to 18° C. After the stirring apparatus has been brought into full operation, 25 cc. of magnesia mixture is added, and after stirring for one-half hour, it is filtered.

The method as given yields the same results as those given by the German Association method (removal of silicic acid by evaporation with hydrochloric acid), the Darmstadt method (elimination of silicic acid by heating with citrate-magnesia mixture), Naumann's method, and the molybdate method. The disadvantage of using the Lorenz method is pointed out, and some comparative results obtained with the Lorenz and the direct method are given. They agree very well.

Technical caseins, their examination and judgment, W. HÖPFNER and H. BURMEISTER (*Chem. Ztg.*, 36 (1912), No. 112, pp. 1053, 1054).—A discussion in regard to the criteria to be utilized in judging caseins destined for food, sizing of paper, etc. The most appropriate methods are described.

An improvement of the method for the determination of galactan, K. MIYAKE (*Jour. Col. Agr. Tohoku Imp. Univ.*, 4 (1912), No. 8, pp. 337-345).—This is an improved method for determining galactan in foods and feeding stuffs, as follows:

"Take a given quantity of the substance to be examined, extract with ether, and place the residue in a beaker together with nitric acid, and evaporate the solution in a water bath exactly in the same manner as recommended in the 'provisional method' [A. O. A. C.] referred to. Filter hot immediately after evaporation and wash well with hot water. The filtrate is again evaporated down to one-third volume of the original solution. After allowing to stand 24 hours, add 10 cc. of water and allow it to stand another 24 hours or longer if necessary. In the meantime the mucic acid will be crystallized. Collect the mucic acid on a tared filter or Gooch, wash with cold water, then with alcohol, and finally with ether; dry at the temperature of boiling water and weigh.

"The amount of the sample to be taken for analysis must be determined according to its galactan content. If its content is below 16 per cent on dry matter basis, 3 gm. can be taken, but if more galactan is contained, then a correspondingly smaller amount of the substance must be used, as otherwise the mucic acid is liable to crystallize out before the filtration. On the other hand, if the amount of galactan is insignificant, and below 0.3 per cent, the filtrate should be evaporated down into one-fifth its original volume, and allowed to stand several days if necessary; otherwise the mucic acid may fail to crystallize even after long standing, and it may lead to an erroneous conclusion."

The estimation of methyl alcohol in ethyl alcohol and in alcoholic drinks, A. BONO (*Chem. Ztg.*, 36 (1912), No. 121, p. 1171, fig. 1).—A description is given of an apparatus to be used in connection with a method in which the methyl alcohol is oxidized into formaldehyde with potassium bichromate and sulphuric acid.

Estimation of the amino acids in plants by means of the formaldehyde method, O. BAILLY (*Bul. Sci. Pharmacol.*, 18 (1911), No. 12, pp. 702-711; *abs. in Chem. Zentbl.*, 1912, I, No. 20, p. 1640; *Analyst*, 37 (1912), No. 436, pp. 312, 313).—If the aqueous extracts of plants are first treated with barium chlorid for the purpose of removing phosphates, and the color is removed with quinin silicotungstate, the amino acids present in the extract may be estimated by the formaldehyde titration method.

"As ammonia is estimated at the same time, this must be estimated separately in another portion of the extract, and an allowance made for its quantity. The details of the process are: One hundred cc. of the extract is treated with 10 cc. of normal hydrochloric acid, 10 cc. of a 10 per cent silicotungstic acid solution, and 10 cc. of a 3.1 per cent quinin hydrochlorid solution, shaken, submitted to centrifugal action and filtered. The filtrate is shaken with animal charcoal, again filtered, and 78 cc. of the filtrate is treated with 1 gm. of barium chlorid, then rendered alkaline with potassium hydroxid solution, diluted to 100 cc., and filtered. Twenty-five cc. of this filtrate (equivalent to 15 cc. of the original extract) is acidified with tenth-normal hydrochloric acid, 1 drop of a saturated p-nitrophenol solution is added, and the solution exactly neutralized with tenth-normal potassium hydroxid solution. Fifteen cc. of neutral formaldehyde solution is now added, and the amino acids are titrated with tenth-normal potassium hydroxid solution, using phenolphthalein as indicator. Let N denote the number of cubic centimeters required for the titration; the ammonia is then estimated by distilling a further quantity of 50 cc. of the extract in the presence of magnesia; the quantity of ammonia is expressed in cubic centimeters of tenth-normal acid—let it be n —then the amount of amino acid in 100 cc. of the extract expressed in terms of nitrogen is found by formula:
$$\frac{(2N-n) \times 0.014}{3}$$
 The results obtained are correct within 3 per cent, except in the case of tyrosin and histidin, where the error may amount to 10 per cent."

With this procedure cabbage leaves were found to contain 0.886 per cent of amino acids (expressed as nitrogen per 100 gm. of dry substance); tobacco flowers, 0.272; turnip leaves, 0.507; alfalfa, 0.35; and carrot tops, 0.28 per cent.

About the progress made in the chemistry of food and condiments during the year 1911, H. KUTTENKEULER (*Chem. Ztg.*, 36 (1912), Nos. 61, pp. 565-568; 63, pp. 585, 586).—This deals with the progress made in food and condiment chemistry, but does not include milk and dairy products, water, brewery products, and bacteriology, for which special reports will be rendered.

Swiss food book (*Manuel suisse des Denrées Alimentaires*. Bern, 1910, 2. ed., rev. and enl., pp. XVI+344).—This describes the official methods of analyses of foods, condiments, waters, beverages, air, etc., of Switzerland. A description of the substances is given in almost every case.

A new method for determining sugar in potatoes, O. CLAASSEN (*Chem. Ztg.*, 36 (1912), Nos. 79, pp. 741-744; 81, pp. 771, 772).—This is a study of methods, the results of which indicate that it is not advisable to determine the sugar content of potatoes with the press juice. When press juices are stored for a time, all the saccharose present becomes inverted. When the polarimetric method is used, the influence which the copper-reducing but optically inactive bodies exert is eliminated as a factor. The method is also advantageous from the point of rapidity of execution.

The use of the hot alcoholic digestion for extracting the sugar was found to be the most feasible procedure. It was also determined that the precipitation of dextrose by lead salts is a process which proceeds very irregularly.

For the determination of sugar in potatoes, the author advises the use of the polarimetric method for the inverted substance (Herzfeld's method was adjusted for use with potatoes), and the application of the dextrose formula. From this another formula was derived which can be used where dextrose and saccharose are present at the same time.

In addition to the above the influence of temperature on the rotation and the space displaced by the potato substance are discussed.

About the coloration of certain reagents by raw cow's milk in the presence of hydrogen peroxid, E. NICOLAS (*Abs. in Chem. Ztg.*, 36 (1912), No. 101,

p. 957).—The coloration produced by various reagents is probably due to the presence of a peroxidase which differs from the vegetable peroxidase. The peroxidase does not occur in donkey's milk, and the author consequently concludes that the peroxidase in milk can not be considered as originating from the food eaten by the animal.

Modifications of the Robin process for butter analysis, MARION (*Ann. Chim. Analyt.*, 17 (1912), No. 7, pp. 256-258; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 599, II, p. 872).—"It is pointed out how essential it is that in Robin's process [*E. S. R.*, 27, p. 812] the temperature should be constant at 15° C. Moreover, the strength of the alcohol (56.5° French) must be maintained all through the operation. Starting from absolute alcohol is very inconvenient, but the author gives instructions how to employ such alcohols as are kept in any laboratory and are of a known strength."

On available sugar and a system of control in the boiling house, N. DEERE (*Hawaiian Sugar Planters' Sta., Agr. and Chem. Bul.* 41, pp. 19).—"A system of control of the boiling house is suggested, based on the formula maximum possible yield = $\frac{s(j-m)}{j(s-m)}$ where *s*, *j*, and *m* are the values of $\frac{\text{sucrose per cent}}{\text{Brix}}$ of the sugars, the juice, and the waste molasses, the ratio being named 'gravity coefficient' to distinguish it from the allied ratios, true purity and apparent purity.

"A further control, based on balance sheets of the gravity solids, sucrose, and gravity nonsucrose, is proposed, by gravity solids being meant the solids as deduced from specific gravity, and the gravity nonsucrose being the difference between the gravity solids and the sucrose."

Chemical technology of fats, oils, waxes, etc., C. STIEPEL (*Einzelchr. Chem. Tech.*, 1 (1911), No. 3, pp. 249-399, *figs.* 22).—This is one of a series of books on chemical technology. It deals with the history, methods of obtaining, purification, and use of fats, oils, and waxes. A chapter on glycerol is also included.

Oils and fats of vegetable origin produced in British India, D. HOOPER (*Agr. Ledger*, 1911-12, No. 5 (*Veg. Prod. Scr.*, No. 116), pp. 107-171).—The object of this publication is to bring together general and technical information relating to the sources, preparation, use, and value of vegetable fats and oils available in India.

The hydrogenation of oils, C. ELLIS (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 2, pp. 95-106, *figs.* 27; *Chem. Engin.*, 17 (1913), No. 3, pp. 93-103, *figs.* 22).—This is a description of the processes used and patented for the hydrogenation of oils. Oleic acid and hydrogen are made to combine and yield stearic acid. "Thus 282 lbs. of oleic acid require 2 lbs. (or about 0.7 per cent) of hydrogen for the production of 284 lbs. of stearic acid, and similarly the transformation of olein into stearin requires the use of about 0.6 per cent hydrogen. . . ."

"Since the addition of less than 1 per cent of hydrogen suffices to convert cotton-seed oil or other vegetable oils into a fatty body of the consistency of lard, it follows that manufacturers of ordinary lard compounds (that is to say, a mixture of 80 to 85 per cent of refined cotton-seed oil and 15 to 20 per cent of oleostearin) have promptly turned their attention to the production of the compound by a 'self-thickened' cotton-seed oil."

See also a previous note by Bömer (*E. S. R.*, 28, p. 616).

Progress made in the field of tobacco chemistry, R. KISSLING (*Chem. Ztg.*, 36 (1912), No. 135, pp. 1321-1323).—This deals with the progress made in the cultivation and preparation of tobacco and the analysis of tobacco and tobacco products during the last few years.

The preparation of potato flakes, E. PAROW (*Abs. in Chem. Ztg.*, 36 (1912), No. 125, p. 1224).—In the potato-drying industry 2 products are prepared, namely, potato chips and potato flakes. The cost of producing both and the machinery required are discussed.

Wine making, J. VENTRE (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 33 (1912), Nos. 28, pp. 38-45; 29, pp. 77-85, figs. 8; 30, pp. 111-119, figs. 7; 31, pp. 140-144, figs. 3; 32, pp. 166-171, figs. 4; 33, pp. 206-214; 34, pp. 233-240, fig. 1; 35, pp. 266-274, figs. 10; 36, pp. 292-304, figs. 6; 37, pp. 326-340, figs. 6; 38, pp. 357-365, fig. 1).—This deals with the systematic and rational making of wine, with many illustrations of wine-making machinery.

The influence of clarification (fining) upon the chemical composition of wines, C. VON DER HEIDE (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 24 (1912), Nos. 4, pp. 253-265; 10, pp. 624-627).—This is a discussion of the subject from the viewpoint of the food analyst.

The addition of isinglass (prepared fish sounds), egg white, curd, and prepared casein does not affect the nitrogen, ash, or extract content of the wine. On adding such substances as wood or untreated animal or vegetable charcoal, a slight increase in ash takes place. Skim milk or whey produces a marked increase in the ash and extract content.

Program and yearly reports of the royal high school for wine manufacture and fruit culture at Klosterneuburg, Austria (*Programm u. Jahresber. K. K. Höh. Lehranst. Wein u. Obstbau Klosterneuburg, 1909-10*, pp. IV+198, pls. 4, figs. 36).—This is the report of the school which was issued at the close of the school year 1909-10, and it also constitutes the jubilee number to commemorate the fiftieth year of the existence of this institution.

Utilization of the solid residue of grapes, A. DE SAPOSTA (*Rev. Gén. Chim.*, 16 (1913), No. 2, pp. 20-26, figs. 2).—This deals with the utilization of the residue from grapes, consisting of pulp, skins, and seeds. It describes the pressing and extraction of the residue, and the use of the extracts and residue therefrom as a beverage or a fertilizer.

The manufacture of alcohol from the nipa palm in the Philippines, L. CAVEL (*Rev. Gén. Chim.*, 16 (1913), No. 2, pp. 17-20, fig. 1).—The nipa palm (*Nipa fruticans*) will furnish a juice which has, at times, the following composition: Saccharose 14 per cent, protein and ash 1.5 per cent, reducing sugar, traces, and water by difference 84.5 per cent. The density of the juice is about 1.0633. The juice after fermentation is used as a beverage (tuba), but appears to be a promising source of alcohol and sugar.

METEOROLOGY—WATER.

Crop safety on mountain slopes, J. C. ALTER (*U. S. Dept. Agr. Yearbook 1912*, pp. 309-318, pls. 2).—This article explains how "mountains are often perfect barriers against evil climatic influences and often actually augment and multiply the influences for good," and shows why it has been possible to extend successful agriculture high up upon mountain slopes.

Some useful weather proverbs, W. J. HUMPHREYS (*U. S. Dept. Agr. Yearbook 1912*, pp. 373-382).—Certain typical proverbs are quoted, and illustrations are given of "their importance in all those cases and circumstances where, unfortunately, a weather service can not take the place of weather signs."

The commercial weather map of the United States Weather Bureau, H. L. HEISKELL (*U. S. Dept. Agr. Yearbook 1912*, pp. 537-539, fig. 1).—This is a brief note on the chalkplate map furnished by the Weather Bureau to newspapers and on the extensive use which has been made of this map.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER, H. W. ANGIER, and E. K. DEXTER (*Massachusetts Sta. Met. Buls.* 293, 294, pp. 4 each).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during May and June, 1913. The data are briefly discussed in general notes on the weather of each month.

Climatic data, E. G. SCHOLLANDER and W. WHITCOMB (*North Dakota Sta. Rpt. Williston Substa.*, 1912, pp. 66, 67).—This is a record of the usual meteorological observations at Williston during 1912.

The climate of San Francisco, A. G. MCADIE (*U. S. Dept. Agr., Weather Bur. Bul.* 44, pp. 33, figs. 14).—The climatic characteristics of San Francisco are summarized from available meteorological records, some of which, as in the case of rainfall and temperature, cover a period of 63 consecutive years.

The rivers and floods of the Sacramento and San Joaquin watersheds, N. R. TAYLOR (*U. S. Dept. Agr., Weather Bur. Bul.* 43, pp. 92, pls. 3, figs. 56).—This bulletin discusses some of the causes modifying stream flow in the Great Central Valley of California, and gives a tabulation of such river and rainfall data as are available in connection with flood periods, with notes on the various floods that have occurred since 1849, more especially those in the Sacramento watershed. A brief description of the larger streams and their watersheds is given, together with distances between important points on the main rivers and their larger tributaries.

Salton Sea water, A. E. VINSON and C. N. CATLIN (*Arizona Sta. Rpt.* 1912, pp. 696-698).—A continuation of studies (*E. S. R.*, 27, p. 508) of the concentration of salts in Salton Sea water is reported, and the results for the 6 years during which the studies have been made are summarized. Of the principal bases present only potash has remained stationary. The increase in sodium has been especially pronounced. Since 1908 the ratio of potassium to sodium (also to total solids) has decreased steadily.

Observations of the close proximity of black alkaline and calcium sulphate waters, A. E. VINSON and C. N. CATLIN (*Arizona Sta. Rpt.* 1912, pp. 698-700).—Studies of samples of black alkaline and calcium sulphate waters occurring in close proximity are reported.

Sterilization of water by ultraviolet light, J. R. DAVIES (*Chem. Engin.*, 17 (1913), No. 5, pp. 177-179).—Experiments with an arc lamp in which iron arcs were substituted for the carbons are briefly reported. The results show that such a lamp yields sufficient ultraviolet rays to sterilize polluted water in thin layers and at short distances from the source of light in a short time, but that the light does not possess great penetrating powers.

SOILS—FERTILIZERS.

The question of the origin of the loess, G. MERZBACHER (*Mitt. Justus Perthes' Geogr. Anst.*, 59 (1913), Jan., pp. 16-18, figs. 5; *Fcb.*, pp. 69-74, fig. 1; *Mar.*, pp. 126-130).—A careful study of the facts bearing upon the origin of the loess, more particularly in Central Asia, leads to the conclusion that the same processes which were originally responsible for the formation of loess in that region are still in operation and have never ceased, although varying in intensity at different times in dependence upon variations in rainfall, wind, and other climatic conditions.

Distribution of humus in California soils, R. H. LOUGHRIDGE (*Proc. Soc. Prom. Agr. Sci.*, 33 (1912), pp. 65-68).—Investigations are briefly reported which show that, contrary to the general belief, there is more humus in California soils

than is found in those of the uplands of the humid regions but that it is more deeply distributed than in the upland soil.

The soils and other surface residual materials of Florida, E. H. SELLARDS (*Fla. Geol. Survey Ann. Rpt.*, 4 (1911), pp. 1-79, pls. 13, figs. 3).—This report deals quite fully with the geological formations from which the soils of Florida are derived and the topography of the State, as well as the chemical composition, classification, and types of soils, the latter including pine lands and alluvial, prairie, swamp, marsh, muck, and hammock lands of various kinds. The most important soil types of Florida as regards extent and agricultural value are the pine lands, the hammock, and the marsh and muck lands. The pine lands are very variable in quality, those having a clay subsoil within a few feet of the surface being particularly valuable. Small areas of productive hammock lands underlaid by marl or limestone are found widely distributed throughout the State. The muck and fresh water marsh lands aggregate not less than 5,000 square miles, including the Everglades. The alluvial lands are but little used for agricultural purposes.

The soils of Mississippi, W. N. LOGAN (*Mississippi Sta. Tech. Bul.* 4, pp. 49, pl. 1, figs. 27).—This bulletin reports the results of original investigations of the typical soils of the State. The soils are grouped in 10 geographical divisions which are represented on a map accompanying the bulletin. Particular attention is given to the chemical composition and mineral plant food contained in the soils.

Truck soils of the Atlantic coast region, J. A. BONSTEEL (*U. S. Dept. Agr. Yearbook* 1912, pp. 417-432, pls. 6, fig. 1).—This article discusses the climatic conditions, transportation facilities, characteristics, and crop adaptations of these soils.

Investigations on soil fertility in Texas, G. S. FRAPS (*Proc. Soc. Prom. Agr. Sci.*, 33 (1912), pp. 59-64).—This is a brief account of investigations which have been more fully reported elsewhere (*E. S. R.*, 28, p. 120).

The object of these investigations was to ascertain whether the condition of plant food in the soil can be determined by extracting the soil with various solvents. The results indicate that there is a relation between the chemical composition of the soil and its need as determined by pot experiments, and that this relation can be worked out in detail and applied to field conditions.

Soil tests, P. V. GOLDSMITH (*Cuba Mag.*, 4 (1913), No. 9, pp. 405-407).—Analyses of red and black Cuban soils are reported, and their fertilizer needs are discussed. The red lands examined contained nitrogen 0.25 per cent, phosphoric acid 0.16 per cent, potash 0.15 per cent, lime 0.50 per cent, and iron 10.26 per cent; the black lands, nitrogen 0.33 per cent, phosphoric acid 0.17 per cent, potash 0.37 per cent, lime 2.59 per cent, and iron 5.43 per cent.

Observations on the agricultural soils of southern Italian Somaliland, P. PRINCIPI (*Gior. Geol. Prat.*, 11 (1913), No. 2, pp. 77-127).—The composition and character of soils of different districts in this region are discussed.

The influence of soil variation on crop production, H. J. WILDER (*Agr. of Mass.*, 1911, pp. 7-31).—The relation of soil variation to the growth of tobacco, cotton, sugar cane, sugar beets, forest trees, and particularly to different varieties of apples, is briefly discussed on the basis of the soil survey work of the Bureau of Soils of this Department. The discussion emphasizes the fact that certain important crops have reached their highest development on particular kinds of soil, indicating the importance of selecting crops and soils with reference to their mutual adaptability.

The composition of the soil water as affected by cultivation and manuring of the soil, J. B. HARRISON, F. A. STOCKDALE, and R. WARD (*West Indian Bul.*, 13 (1912), No. 2, pp. 110-125).—In continuation of previous experiments

(E. S. R., 20, p. 919), the amount and form of nitrogen and the amount of various mineral constituents in soil water under varying conditions of season, cultivation, and manuring were studied.

The results confirm those of previous experiments in showing that in a dry season there is almost no ammoniacal nitrogen but a relatively high proportion of nitric nitrogen in soils, but that when the rainy season begins the conditions are reversed. It was found that calcium salts were more quickly and completely precipitated when soil solution was evaporated in air nearly free from carbon dioxid than in an atmosphere charged with this gas, as is the condition in soils supplied with a sufficient amount of organic matter, thus emphasizing the importance of keeping the soil well supplied with organic matter.

The effects of cultivation and of manures on the soil of the manurial experiment fields, J. B. HARRISON, F. A. STOCKDALE, and R. WARD (*West Indian Bul.*, 13 (1912), No. 2, pp. 140-177).—It was found that the normal alkalinity of these soils was increased by cultivation and by the action of certain chemical manures. Long continued cultivation produced excessive alkalinity in the capillary waters of the soil and reduced the growth of crops. The incorporation of organic matter in the soil tended to increase the carbon dioxid and thus to hold the salts of lime in solution. Continuous use of nitrate of soda in heavy applications injuriously affected the physical properties and productiveness of the heavy clay soils. On account of the high alkalinity of the soil ammonium sulphate has given better results than sodium nitrate. Long continued cultivation improved the texture of heavy clay land. The judicious use of natural and artificial manures increased this effect, the upper layers of the soil tending to become lighter in texture.

Observations on soil inoculation, J. G. LIPMAN (*Proc. Soc. Prom. Agr. Sci.*, 33 (1912), pp. 69-75).—Summarizing observations largely made at the New Jersey Stations, the author concludes that soil inoculation is made more effective by so modifying the soil as to make it a fit culture medium for legume bacteria by the use of lime, readily available mineral fertilizers, and green manures or animal manures.

Influence of humus as well as carbon dioxid fertilizing on the growth of plants, L. HILTNER (*Prakt. Bl. Pflanzenbau u. Schutz*, n. ser., 11 (1913), No. 4, pp. 45-52, fig. 1).—This is a critical review of work by Krantz, based upon 10 years' investigation along similar lines by the author, and emphasizing especially the fact that the action of humus and the processes to which it gives rise in the soil are important factors in determining the effectiveness of other fertilizers.

Fixation of nitrogen by alumina and carbon, S. A. TUCKER and H. L. READ (*Trans. Amer. Electrochem. Soc.*, 22 (1912), pp. 57-66, figs. 2).—This is the full text of a paper, an abstract of which has already been noted (E. S. R., 28, p. 222).

Air nitrate, G. BRION (*Luftsalpeter. Berlin and Leipsic*, 1912, pp. 154, figs. 50).—This book describes and explains the principles underlying electrical methods of preparing nitrogen compounds from the air. It contains a bibliography of 87 references to the literature of the subject.

The percentage of total phosphorus in flat turnips as influenced by the amount available in soils, B. L. HARTWELL (*Rhode Island Sta. Bul.* 154, pp. 121-148).—This bulletin is based mainly upon chemical studies of samples of flat turnips grown in cooperative experiments with farmers in different parts of the State to determine the phosphorus requirements of the soils.

"It was found that in similar seasons the percentage of phosphorus in the turnips from the different soils usually varied in the same direction as the amount of available phosphorus in the soil; and it seems probable, especially

under similar climatic conditions, that the relative amount of available phosphorus in different soils may be indicated by the relation between the percentages of phosphorus in turnips grown in those soils.

"The percentages of phosphorus pentoxid in dry matter varied from 0.27 in turnip roots grown on an extremely deficient soil to 1.82 in turnips from a soil so abundantly supplied with phosphorus that further manuring even depressed the yield. Practically maximum growth was usually obtained if the percentage was as much as about 1, and a fair growth if it were perhaps a fourth less.

"Apart from the fact that marked increases in the phosphorus percentage of turnips were caused by applications of acid phosphate, the following observations were afforded by the work, although the data were meager in some instances. When grown in a given soil, turnips of the same age, but of different sizes contained about an equal percentage of phosphorus, but those grown for a longer time contained a smaller percentage. In no case did liming increase the rate of growth more than the rate of phosphorus absorption; that is, the percentage of phosphorus was not decreased. Applications of muriate of potash appeared to increase the percentage of phosphorus.

"In a pot experiment three different crops of turnips were grown with a limited amount of phosphorus and two different amounts of water. In no case did the larger amount of water increase the rate of growth more than the rate of phosphorus absorption; the percentage was increased in one crop of turnips and was practically unchanged in the other two."

Observations on bone meal as a phosphatic fertilizer, B. SCHULZE (*Ztschr. Landw. Kammer Schlesien*, 16 (1912), No. 51, pp. 1620-1623; *abs. in Ztschr. Angew. Chem.*, 26 (1913), No. 24, *Referatenteil*, pp. 195, 196).—Comparative tests of superphosphate, Thomas slag, and steamed bone meal on soil very poor in lime showed that, taking the action of phosphoric acid and superphosphate as 100, the steamed bone meal was from 46 to 53 and Thomas slag 90. The general conclusion is that with such a low efficiency bone meal is a very expensive fertilizer.

An available type of raw phosphate, I. V. IAKUSHKIN (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou)*, 19 (1913), No. 1, pp. 152-178, figs. 7).—Pot experiments with a rock phosphate which showed a comparatively high degree of availability for oats and millet are reported.

Preparation of superphosphate with waste sulphuric acid from petroleum purification, V. P. KOCHETKOV (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou)*, 19 (1913), No. 1, pp. 69-72).—By the use of this waste material double superphosphates of good physical properties containing about 21 per cent of phosphoric acid, practically all of which was soluble in water, were obtained from bone meal, and containing about 14 per cent, somewhat less soluble, from rock phosphate.

The utilization of sodium bisulphate for the preparation of phosphatic fertilizer, V. P. KOCHETKOV (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou)*, 19 (1913), No. 1, pp. 33-55).—Experiments are reported in which precipitated phosphate was successfully prepared from bone and certain Russian rock phosphates by treatment with sodium bisulphate, a by-product of nitric acid manufacture, and subsequent precipitation with lime. It was found that the phosphoric acid of the bone and rock phosphates was practically all dissolved by the bisulphate, and a precipitated phosphate obtained which contained over 25 per cent of phosphoric acid of which over 90 per cent was soluble in ammonium nitrate.

The preparation of phosphoric acid and double superphosphate with sodium bisulphate, V. P. KOCHETKOV (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou)*, 19 (1913), No. 1, pp. 60-68).—In the experiments re-

ported sodium bisulphate was substituted for sulphuric acid. A Russian rock phosphate was treated with the bisulphate, the product obtained dissolved in water, and the solution evaporated until sodium sulphate crystallized out. When the solution was concentrated to 45° Baumé it contained from 20 to 22 gm. of phosphoric acid per liter, and this solution readily attacked steamed bone meal and yielded a double superphosphate of good physical quality, but which contained only from 24 to 25 per cent of phosphoric acid, from 92 to 98 per cent of which was soluble in water.

The action of iron sulphid and its oxidation products in combination with phosphorite, P. E. GAL'TSEV and I. V. IĀKUSHKIN (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou)*, 19 (1913), No. 1, pp. 223-232, figs. 2).—In pot experiments the use of iron sulphid in combination with rock phosphate did not increase the assimilation of phosphoric acid. The use of a modified pyrite, containing sulphate and sulphuric acid, however, produced a beneficial effect in this respect.

Possible sources of potash in the United States, F. K. CAMERON (*U. S. Dept. Agr. Yearbook 1912*, pp. 523-536).—The results of special investigations made by the Bureau of Soils and the U. S. Geological Survey on this subject are briefly summarized. The minor sources of potash discussed are wood ashes, wool washings, pomace and vinasse, artificial niter, sunflowers and desert plants, carbonate ponds of Nebraska and vicinity, rock salt and brines; the major sources, alunite, feldspar, and potash silicates, desert basins, and giant kelps. The general conclusion is "that the United States has at hand known possible sources of potash sufficient to supply its present and prospective needs. It has possibly, but not yet proved, sources sufficient to supply many times its own needs. Some of these have apparently so much promise, commercially, as to justify the expectation that potash salts of American origin may be a factor in the market in the near future."

The effect of sodium manuring on the composition of plants, B. L. HAERTWELL and P. H. WESSELS (*Rhode Island Sta. Bul. 153*, pp. 89-118).—The results of investigations which have been carried on at the station for a number of years are summarized as follows:

"The field experiment, involving 48 plats, was begun in 1894. The soil was kept supplied with liberal amounts of nitrogen and phosphorus. Different relative quantities of potassium and sodium in chlorids and carbonates were applied to separate plats. Two different amounts of lime were used, but in all cases the soil still reacted somewhat acid to litmus paper. During the early part of the experiment the average maximum applications per year of the potassium and sodium salts were from about 250 to 420 lbs. per acre; but during the years 1907 to 1910, in which was undertaken the work not heretofore published, the applications of potassium and sodium were reduced to about one-third of these amounts.

"Earlier published determinations of the plant-food materials in the crops showed that an increase in the sodium manures increased the percentage of phosphorus, but not of nitrogen, in the crops. The percentage of sodium was likewise increased, but that of potassium was decreased in the majority of cases.

"The results with onions in a single year, 1908, showed that the addition of the full ration of sodium to the full ration of potassium affected uniformly neither the size of the crop nor the percentage of total and reducing sugars. Furthermore, although in the presence of the full ration of sodium the reduction in the amount of potassium to one-half and one-fourth rations resulted in successive decreases in the crop, the percentage of sugar was not universally changed. Incidentally it was shown that ordinary drying of onions reduces the amount of total sugar and increases the proportion of reducing sugar.

"Mangel-wurzels from certain of the plats were analyzed each year from 1907 to 1910. The yields of this crop showed as a rule that, even with the full ration of sodium, the quarter ration of potassium was not sufficient for maximum growth, and that in many cases the same was true of even a half ration. A reduction from the full to the quarter ration of sodium in connection with the quarter ration of potassium usually depressed the yield.

"The average differences, with the different rations and series, indicated in most cases a tendency toward a depression in both the total and reducing sugar as a result of the addition of sodium; these differences, however, were usually within the limit of error, and furthermore were the resultants in many cases of individual increases as well as decreases in the percentage of sugar. A 25 per cent increase in yield of beets was not an unusual result of adding sodium manures, so that even if the percentage of sugar were slightly depressed the amount produced would be much increased.

"Partial shading in order to produce conditions similar to those existing in cloudy weather did not alter the sugar content of mangels in a conclusive way.

"Although the substitution of sodium for potassium materially decreased the growth of potatoes, the percentage of starch, hydrolyzed by acid was not changed. The percentage of nitrogen, however, was increased and the ash decreased by the substitution. The increase in the nitrogen was shown to be due to the omission of potassium rather than to the addition of sodium; the increase was also quite general in other root crops."

Inspection of commercial fertilizers, F. B. MUMFORD and P. F. TROWBRIDGE (*Missouri Sta. Bul.* 109, pp. 139-177).—Analyses and valuations of some 700 samples of fertilizers inspected under state law during 1912 are reported and discussed.

Analyses of licensed commercial fertilizers, 1913, F. W. WOLL (*Wisconsin Sta., Circ. Inform.* 44, pp. 17).—The guaranteed and actual analyses of fertilizers inspected during the year are reported with explanatory notes on the results of inspection. The text of the state fertilizer law is also included.

Manures and feeding stuffs: A scheme of compensation under the Scotch Agricultural Holdings Acts, J. MILNE (*Scot. Farmer*, 21 (1913), Nos. 1062, pp. 438, 439; 1063, p. 466; 1064, pp. 491, 492; 1065, p. 516).—The difficulties of securing just valuations for compensation under these acts are discussed.

AGRICULTURAL BOTANY.

The living plant, W. F. GANONG (*New York*, 1913, pp. XII+478, table 1, pls. 3, figs. 178).—As indicated by the title, this book treats of the plant as a living organism, describing and interpreting its functions and structures so far as they come within ordinary observation and experience. The author has not attempted to treat the subject exhaustively, as he says the book is not primarily intended for botanists but for students. Many observations and hypotheses of recent discovery are purposely omitted, the author preferring a safe conservatism rather than a radical acceptance of many of the newer ideas.

Extensive use is made of diagrams and generalized and conventionalized drawings to explain many phenomena, and it is believed their use will materially aid in giving a proper conception of some of the functions and activities that are otherwise difficult to explain to beginners in plant physiology.

The cause of growth in plants, II, G. A. BOROWIKOW (*Biochem. Ztschr.*, 50 (1913), No. 1-2, pp. 119-128).—Continuing work previously noted (E. S. R., 29, p. 26), the author states that salts of weak bases, favoring ready hydrolysis, are promotive of plant growth and that these are but slightly retardative in high concentrations, in this respect differing greatly from the salts of stronger

bases. Rapidity of growth is said not to be proportional to the turgor of the plantlets employed. He inclines to the view that differences in rate of growth are to be ascribed to differences in degree of hydration of the plasma colloids.

The influence of different substances on the germination of seeds and on plant growth, I, II, III, T. BOKORNY (*Biochem. Ztschr.*, 50 (1913), No. 1-2, pp. 1-118).—Continuing work previously noted (E. S. R., 28, p. 527), the author gives the detailed results thus far obtained from an extensive but still incomplete investigation on the influence of salts, etc., on seeds and seedlings of several plants. The general conclusion is reached that for most substances regarded as poisonous, concentrations exist which promote plant development; but that since the points of injurious concentration on the one hand and of inoperative dilution on the other are generally close together, the limits within which stimulation occurs are probably too narrow to be of practical importance in most cases.

Frost and light as factors in seed germination, W. KINZEL (*Frost und Licht als beeinflussende Kräfte bei der Samenkeimung*. Stuttgart, 1913, pp. VII+170, pl. 1, figs. 4; *abs. in Ztschr. Bot.*, 5 (1913), No. 5, pp. 377-380).—Besides a review of related literature, the author gives numerous detailed and tabulated data obtained from his investigations during about 10 years on the effects of light, frost, and other influences on the germination of seeds from widely divergent groups, largely wild plants or weeds requiring control.

The influence of the endosperm on the development of the embryo, M. DUBARD and J. A. URBAIN (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 14, pp. 1086-1089).—As a result of their repetition of certain experiments made on wheat, oats, barley, etc., the authors state that the endosperm of seeds, while not indispensable to early embryonic development, is helpful thereto, especially during the first stages. In general the reserves enclosed with the embryo are indispensable, as shown by the fact that if decreased to a certain point in certain cases the plantlet dies, having reached only a very limited development.

The formation of the anthocyan pigments of plants.—IV, The chromogens, F. KEEBLE, E. F. ARMSTRONG, and W. N. JONES (*Proc. Roy. Soc. [London]*, Ser. B, 86 (1913), No. B 588, pp. 308-317).—This is a contribution to the biochemistry and genetics of flower pigmentation and deals primarily with the chromogens occurring in flowers.

The formation of the anthocyan pigments of plants.—V, The chromogens of white flowers, W. N. JONES (*Proc. Roy. Soc. [London]*, Ser. B, 86 (1913), No. B 588, pp. 318-323).—This communication is in continuation of a series on the formation of pigments in plants and describes principally the chromogens of white flowers. The method pursued in this investigation was that of bringing chromogen and oxidase together, causing them to interact with one another. By such methods the author has separated white flowers into the following types: Those which contain an oxidase and a chromogen, those which contain a peroxidase and a chromogen, those which contain a peroxidase but no chromogen, and those which contain no oxidase or peroxidase.

Studies of irritability in plants.—III, The formative influence of light, G. J. PEIRCE (*Leland Stanford Jr. Univ. Pubs., Univ. Ser., Dudley Mem. Vol.*, 1913, pp. 62-80, pl. 1).—By means of a multiple clinostat, a description of which is given, the author carried on experiments on the prothalli of ferns and plants of liverwort, *Fimbriaria californica*, *Anthoceros fusiformis*, white mustard, and wheat to determine the effect of light on their development.

Analyzing the results obtained, he shows that light affects the direction, kind, rate, and amount of growth. It was found that a uniform illumination increases symmetry in development. In certain instances this symmetry appeared to be complete, a dorsi-ventral structure giving place to a radial one. The

stimulating effect of light further showed itself not merely in an increase in size, but also in a change in form. It was further found that, although the archegonia and antheridia of ferns are usually produced on the shaded side of the prothallus, where the illumination was equal they were formed on both sides, and there were indications that uniform illumination resulted in an increased proportion of female prothalli.

The replacement of zinc by uranium in cultures for *Aspergillus niger*, C. LEPIERRE (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 15, pp. 1179-1181).—According to the author's investigations with uranium nitrate, it is claimed that this salt can replace zinc in Raulin's solution and that it exerts a remarkable influence on the rapidity of the growth of *A. niger*.

Some relations between salt plants and salt spots, W. A. CANNON (*Leland Stanford Jr. Univ. Pubs., Univ. Ser., Dudley Mem. Vol.*, 1913, pp. 123-129).—A study was made of plants growing in a salt spot near Tucson, Ariz., where the soil contains a considerable amount of sodium salts.

Chemical analyses and electrical resistance tests were made of three species of Atriplex, which occur naturally in this area, and it was found that the salts of sodium and calcium were present in unlike amounts in the ash of the plants. The electrical resistance tests showed in general that the resistances were characteristic for the different species, *A. canescens* having the highest and *A. nuttallii* the lowest resistance. Where the soil solution was most dense and carried the most sodium salts, *A. nuttallii*, which contained the largest amount of soluble salts and the largest proportion of sodium, was the most abundant species, while those containing this salt in less amount with an increased content of calcium were species from the outer portion of the salt spot.

Town smoke and plant growth, C. CROWTHER (*Jour. Roy. Hort. Soc. [London]*, 38 (1913), No. 3, pp. 461-468).—The author gives a summary of recent investigations on the effect of smoke on plant growth, the principal conclusions being in part based upon experiments noted elsewhere (*E. S. R.*, 26, p. 229).

The use of the manometer in sap movement, E. REINDERS (*Rec. Trav. Bot. Néerland.*, 10 (1913), No. 1, pp. 1-68, pls. 3, figs. 7).—The use of the manometer in connection with studies in sap movement is described and an account given of investigations on sap flow in *Sorbus americana*.

Structure and life history of bacteria, W. BENECKE (*Bau und Leben der Bakterien. Leipzig and Berlin*, 1912, pp. XII+650, figs. 105).—The author has brought together the more general facts and important details concerning the nature, relations, and activity of bacteria, discussing among other topics the culture methods of bacteriology; the morphology of bacterial cells; the systematic relations of bacteria (based on both morphological and physiological characters) and their variability; their general living conditions, stimulation movements, and metabolism; dissimilation phenomena, including fermentations; the nitrogen fixing and denitrifying bacteria; the presence and distribution of bacteria on the earth; bacteria of cultivated soil, meadow, forest, and water; and bacteria as inhabitants of other organisms, both plant and animal, including man. The work concludes with an index of authors referred to and one of subject matters treated.

Report of the imperial agricultural bacteriologist, C. M. HUTCHINSON (*Rpt. Agr. Research Inst. and Col. Pusa [India]*, 1911-12, pp. 78-83).—The author reports investigations on soil bacteriology, stating that the method of determining bacterial activity by plate counts has been abandoned in favor of measurements of the physiological activity of the soil organisms. By use of the latter it is possible to maintain conditions comparable to those in the field and to determine optimum conditions of moisture, etc., for any particular soil as regards ammonification, nitrification, etc.

It is believed that carbon dioxid formation in a soil is a reliable measure of the bacterial activity therein and an index of changes unfavorable thereto. By measuring such formation of carbon dioxid it was possible to determine optimum moisture content as regards bacterial activity, this varying from 16 to 37 per cent. It was found possible also thereby to ascertain the optimum proportions for addition of such substances as lime or superphosphate in order to promote the decomposition of green manures, oil cake, etc., also to direct practice to the advantageous control of moisture content of soils.

The investigations seemed to show that the high relative rate of bacterial activity and consequent biologic changes taking place in Indian soils are due to the higher temperature (25 to 30° C.) during much of the year, as compared with that in European soils, averaging 15 to 18°. At the lower temperature ammonification and nitrification go on at about equal rates. At the higher temperature the former proceeds much more rapidly and may produce so high a concentration of ammonia in the soil water as to diminish or inhibit nitrification, so that much nitrogen may be lost in the form of ammonia. These facts are considered to have important bearings upon practical operations in agriculture.

It appears also that when intense bacterial activity is present in soils, nitrates are reduced without occurrence of anaerobic conditions, being utilized presumably as a nitrogen source by the bacteria. At Pusa, the optimum moisture content is 16 per cent while general bacterial action is intense up to 25 per cent, and at the latter humidity rapid reversion of nitrate to the protein form takes place. This is thought to explain in part the fact that at Pusa and in the Punjab excessive moisture resulted in nitrogen starvation of the wheat crop. The formation and effects of bacteriotoxins are still under investigation, as are also the effects of green manuring upon soil conditions and subsequent crops.

A bacterial disease of tobacco at Rangpur was found to be due to a strain of *Bacillus solanacearum*, which was pathogenic also to eggplant, tomato, *Datura*, and potato. The parasitism seemed weak originally, but was found capable of cultivation to a high degree of virulence, from which fact it is thought best to leave no plants for a second cutting in the infected areas. A bacterial disease of wheat in Punjab, locally known as tannan or tandu, was found to be due to an attack of a bacillus closely resembling *Pseudomonas hyacinthi*. This, however, is thought to be confined to small badly drained areas and of little economic importance under proper cultivation.

Studies with sterile cultures of higher plants, I. SCHULOW (*Ber. Deut. Bot. Gesell.*, 31 (1913), No. 3, pp. 97-121, figs. 2).—In continuance of previous work (E. S. R., 27, p. 634; 28, p. 225), the author reports that his investigations confirmed the influence of micro-organisms on the solution of organic phosphates.

It is stated that peas and corn assimilated the phosphoric acid of phytin but not that of lecithin, also that the roots of both peas and corn separated reducing and nonreducing sugar and malic acid, ammonium nitrate proving a better source of nitrogen than calcium nitrate. Young plants utilized at first the nitrogen from the ammonium radical of ammonium nitrate in the higher degree, but later that from the nitrate radical in about equal degree, and still later in the higher degree. This change in nitrogen source corresponded to a change in the physiological character of the solution from acidity at first, through neutrality, to alkalinity. The physiological acidity of ammonium nitrate is thought to play an important part in the solution and utilization by higher plants of the phosphates which are insoluble in water.

The prevalence of *Bacillus radicola* in soil, K. F. KELLERMAN and L. T. LEONARD (*Science*, n. ser., 38 (1913), No. 968, pp. 95-98).—The authors report

upon a test of the synthetic medium prepared by Greig-Smith (E. S. R., 26, p. 816) for the determination of *Rhizobia* in the soil. Their experiments led to the conclusion that *B. radicola* grows sparingly and shows no special characteristics upon synthetic agar made in accordance with the formula mentioned above.

Correlation studies of some hybrids, TINE TAMMES (*Rec. Trav. Bot. Néerland*, 10 (1913), No. 1, pp. 69-84).—The results of studies of the correlation of various flower, leaf, and fruit characters of hybrids between *Linum angustifolium* and a variety of cultivated flax (*L. usitatissimum*) from Egypt are reported.

A striking correlation in the peach, U. P. HEDRICK (*Science*, n. ser., 37 (1913), No. 963, pp. 917, 918).—During the spring of the current year attention was called to the fact that in a considerable number of varieties of peaches there was found a difference in the color of the inside of the calyx cups. In some the color was light green, varying somewhat in different varieties, while in others the inner part of the cup was a deep orange in color.

In considering this difference in color of the flower and the characters of the fruit, a correlation was shown. Of the peaches 145 varieties were white in flesh and green inside the calyx cup, and 162 yellow in flesh and orange inside the calyx cup. In the nectarines white and green were correlated in 36 varieties, and yellow and orange in 11 varieties.

This correlation is believed to be of practical value in peach breeding, since it will enable the breeder to determine the color of flesh of peaches somewhat earlier than otherwise, and it will also add a constant taxonomic character, which may be of value to peach growers.

Is the biennial habit of *Oenothera* races constant in their native localities, G. F. ATKINSON (*Science*, n. ser., 37 (1913), No. 958, pp. 716, 717).—The author states that from his experience in the culture of *Oenothera* he is led to believe that their behavior as to a strict biennial habit in even their native locality may be different under cultural conditions in either the greenhouse or garden from what it is in the open field. Fully formed rosettes potted in the autumn and taken into the greenhouse did not form stems nor come into flower any earlier than plants wintered in the garden. Attention is called to the possibility of certain races of *Oenothera* becoming perennial or taking on a perennial habit under certain conditions.

Seeds and plants imported during the period from January 1 to March 31, 1912: Inventory No. 30 (*U. S. Dept. Agr., Bur. Plant Indus. Bul.* 282, pp. 99).—This inventory gives an account of seeds and plants imported during the period indicated, the number of items being about 1,900. These represent material forwarded by a number of persons, and among them are collections made by F. N. Meyer in Chinese Turkestan, C. V. Piper of forage plants in India, and W. T. Swingle of various plants discovered during a recent trip to Spain.

FIELD CROPS.

[Experiments in field crops], E. G. SCHOLLANDER (*North Dakota Sta., Rpt. Williston Substa.*, 1912, pp. 14-65, figs. 2).—This report continues previous work (E. S. R., 29, p. 226).

In the cereal plant nursery, which is considered by the author a very satisfactory method of plant selection, kowliang sorghum and proso are proving of value. A variety of the latter, Black Vorenezh G. I. No. 16, yielded at the rate of 24 bu. per acre, testing 57 lbs. per bushel. In a variety test with spring wheat the yields ranged from 40.7 to 51.7 bu. per acre. The average yields of different classes of wheat for the years 1908 to 1912 were Blue Stems

21.5 bu., Fifes 23.2 bu., and durums 22.8 bu. per acre. Wheat seeded at the rate of 6 pk. per acre produced the heaviest grain, and 5 pk., the largest yield, in comparison with 3, 4, and 7 pk. The only variety of winter wheat which survived the winter was sown in corn in August and yielded 35.5 bu. per acre, weighing 63.5 lbs. per bushel.

In a variety test of oats the yields ranged from 50.3 to 120.6 bu. per acre. In seeding oats at the rate of 2, 4, 6, 8, and 10 pk. per acre, the smallest rate gave the best results in 1912, although in 1911 it gave the poorest yield. In a variety test with barley the yields ranged from 36 to 74 bu. per acre. For an average of 5 years, from 1908 to 1912, 2-rowed barley yielded 25.6 bu., and 6-rowed barley, 28.4 bu. per acre. Two varieties of emmer yielded 79.5 and 78 bu. per acre in 1912, with a 5-year average of 31.7 and 32.8 bu., respectively, and spring rye yielded 43.6 bu. in 1912, with a 4-year average of 24.7 bu.

In a variety test with flax the yields ranged from 19.7 to 30 bu. per acre. Three pk. of flaxseed per acre proved considerably more satisfactory than 2 or 1 pk.

Analyses and cooking tests failed to show any difference in the starch content or cooking qualities of irrigated and nonirrigated potatoes. Potatoes were successfully stored in pits covered with manured boards and soil, the shrinkage being from 6.9 to 7.7 per cent. Potatoes yielded from 138.3 to 273.8 bu. per acre in a variety test, and for an average of 4 years. potatoes planted 4 in. deep gave better results than when planted 6 or 8 in. The results of 2 seasons indicate that about the middle of May is the best time to plant potatoes at Williston. Four-year averages show better results by planting potatoes 12 in. apart in the row than 24 in. In a 4-year average large potatoes planted whole gave the largest yields, but large tubers cut to 2 or 3 eyes per piece produced more economically. A 3-year average showed that potatoes planted 4 in. deep and cultivated yielded better than those planted under 6 in. of straw mulch. In comparing the production of seed potatoes grown by irrigation and those grown by dry farming, there was a slight difference in favor of the seed from irrigation.

No definite results were obtained in comparing irrigated and nonirrigated grown oats and wheat for seed purposes. Alfalfa seemed to do equally well with or without a nurse crop, and whether irrigated or not. Ample rains prevented any irrigation experiments in 1912, and sugar beets yielded heavier than in the 3 previous years, the yields ranging from 17.4 to 24.9 tons per acre and the sugar content from 14.6 to 17.5 per cent. Cereals grown on summer fallow produced better than when grown on corn stubble, or when cereal followed cereal.

In a tillage experiment, "in spite of the fact that there was more moisture in the soil for the average of the season on the fall plowed plats, in 10 out of 12 cases the spring plowed plats produced slightly larger yields per acre of wheat, oats, and corn fodder, while in 11 cases out of 12 the crops grown on summer fallowed land were considerably larger than either fall or spring plowed plats. In several instances the yields were doubled."

Data on the fluctuation of moisture due to cropping show that "over a period of 4 years in growing corn, wheat, and oats, it is found that in 10 out of 11 plats the percentage of moisture in the soil decreased from spring until fall, ranging from 0.5 to 6.9 per cent on the various plats. On the particular plat which showed an increase of 0.9 per cent of moisture, corn was grown in 1912. Taking this plat into consideration there was an average loss of 3.4 per cent on each plat. Every plat (a total of 11) that was summer fallowed showed an increase ranging from 0.9 to 5.4 per cent in moisture from spring

until fall, or an average of 3.2 per cent for each plat. This calculation is based on the moisture content to a depth of 6 ft."

New work in dry farming, A. M. McOMIE (*Arizona Sta. Rpt. 1912, pp. 665-671, fig. 1*).—This article contains descriptions of soils and climatic conditions at 2 dry farms recently acquired and results of the experimental work under way.

At the Prescott dry farm trials were made of varieties of cereals, field corn, sweet and pop corn, beans, sorghum, cotton, potatoes, alfalfa, and field peas, among the most promising of which are mentioned yellow dent corn for forage, the Bates and tepary varieties of beans, shallu sorghum, Coconino blue potatoes, and Turkestan alfalfa.

"Data on the best way in which to leave the surface so as to catch the torrential rains deserve mention. One such storm occurred July 23, when 1.92 in. fell in slightly less than 2 hours. After the first 40 minutes the country was a sheet of water, gullies were rushing torrents and Granite Creek became a turbulent river. Good sized streams ran down the corn, bean, and potato rows, making them appear as after a heavy irrigation. On surfaces left quite level, as after a harrow, the penetration, 40 minutes after the storm ceased, was 6 in.; on surfaces checked with right angle disking the penetration was 8 in.; and on clod mulch it was nearly 11 in. Later, moisture determinations in these plats showed even more striking results in favor of the clod mulch."

It is noted that one harrowing completely destroyed young weeds, while only two-thirds of those on an adjoining plat were destroyed by 2 harrowings 1 week later.

At the Snowflake dry farm, pink beans yielded 204 lbs. of beans per acre, and dwarf milo maize 2,468 lbs. of dry plants. Amber cane, shallu, red and white Kafir corn, and teosinte and broom corn were also tried without much success. Red Kafir corn gave the highest yield, 4,820 lbs. of dry matter per acre.

Results of cooperative work at Flagstaff show the value of Turkey red wheat. White hull-less barley, wheat, oats, vegetables, and potatoes are reported as being sure crops in this section.

Observations at Tucson indicated that olives may be successfully cultivated, but tepary beans, millet, milo maize, and Kafir corn failed to mature seed.

Irrigation, cultivation, and drainage experiments, B. E. KRÜGER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 5 (1912), No. 1, pp. 21-33*).—At Bromberg on a sandy soil, nonirrigated potatoes yielded 7,800 kg. per hectare (6,942 lbs. per acre) and those heavily irrigated 26,300 kg. The starch content was 17.9 per cent with the lower yield and 21.9 per cent with the larger. The average of 6 irrigation experiments showed that for each gram of dry matter produced by the tubers, 572 kg. of water was required.

When grass was watered 6 times during the season 8,750 kg. of hay was produced per hectare, as compared with 5,340 kg. when watered 3 times, and 2,730 kg. when not irrigated. The best yields with oats, rye, and barley were obtained in seeding when the drills were placed 20 cm. (about 8 in.) apart. Oats produced larger yields on using 120 kg. of seed per hectare than with 90 or 60 kg. Barley produced better yields with 70 kg. of seed per hectare than with 140 or 100 kg. Rye gave larger yields with 90 kg. than with 120 or 60 kg. One hoeing in the spring apparently increased the yield of oats by 680 kg. of grain per hectare; of rye only 70 kg.; and reduced the yield of barley by 210 kg. In regard to liter weights and single kernel weights, the 20 cm. distance resulted better than the 30 cm. distance between the drills.

In Koppenhof experiments it was shown that irrigation without fertilizers was unprofitable, while fertilizing without irrigation paid. On areas fertilized and irrigated 4 times to a depth of 50 mm., each time, beginning May 15,

oats yielded 360 kg. per hectare increase over fertilized plats without irrigation, and areas fertilized and irrigated 8 times beginning with May 15, an increase of 1,180 kg. Carrots did not give profitable returns with irrigation, but it is pointed out that sandy soil newly cultivated is not suitable for the production of carrots. With meadows irrigated from the middle of May to September 12, in one case 12 times, totalling 480 mm. water, there was produced 2,190 kg. per hectare; and in another case 24 times, totalling 960 mm., the yield was 3,840 kg. Both yields were made at a profit.

In a drainage experiment at Josephdorf, drains were placed 1.2 and 0.9 meters in depth, and 8, 12, and 16 meters apart, and one-half was aerated. The field was sown to barley. The highest yields were secured by aeration with the most shallow drains, and without aeration with the deepest drains. It is noted that the depth of drains had no appreciable influence on the yield but that the shortest distance between the lines gave the best results.

At Bromberg in a lysimeter experiment with oats, when the ground water depth was maintained at 0.4 meters, a yield of 2,940 kg. of grain was produced; with the ground water at 0.8 meters, 3,000 kg.; and without maintaining a water level only 340 kg. per hectare. Aeration resulted in a yield of 1,150 kg., and without aeration the yield was 137 kg. It was concluded that a sandy soil does not need aeration.

Field experiments, 1911 (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 12 (1912), No. 3, pp. 439-491).—This paper gives results of field experiments with barley, meadow hay, potatoes, mangels, oats, turnips, wheat, sugar beets, and flax.

Liquid manure apparently produced better gains with hay than either barnyard manure or commercial fertilizers. A 10-year average of potato yields showed the best results with 15 tons of barnyard manure, 1 cwt. sulphate of ammonia, 4 cwt. superphosphate, and 1 cwt. muriate of potash per acre. Sugar beets produced better planted on the flat than with the drill method, with yields of 20 and 18 tons per acre, and 18.7 and 18.2 per cent sugar content, respectively.

Report on cooperative variety tests, 1911, P. BOLIN (*K. Landtbr. Akad. Handl. och Tidskr.*, 51 (1912), No. 7-8, pp. 497-522; *Meddel. Centralanst. Försöksv. Jordbruksområdet*, 1912, No. 64, pp. 28).—Detailed accounts are given of variety tests conducted by 16 Swedish county agricultural societies during the year 1911. The report covers 240 series of trials with different varieties of cereals, legumes, root crops, and potatoes.

Reclamation of sand areas, A. MACPHERSON (*Jour. New Zcal. Dept. Agr.*, 5 (1912), No. 4, pp. 364-370, figs. 7).—This article describes experiments to reclaim sand areas with lupines, gorse, broom, and alfalfa, in which alfalfa gave very satisfactory results not only in binding the sand but also in the yield of hay.

Grass investigations in the Ozark upland, M. F. MILLER and C. B. HUTCHINSON (*Missouri Sta. Bul.* 108, pp. 89-138, figs. 21).—The results obtained in 15 cooperative tests with grasses for pasture on typical upland Ozark soil "show that there is little distinction to be made in the adaption of any of the grasses tested to the different groups of soils, with the possible exception of the adaptation of orchard grass to the Springfield group. On the other hand, there are a few of the grasses which show almost a universal adaptation. Of these, orchard grass, redtop, Kentucky bluegrass, and timothy are the most important. The most striking thing that has been shown, however, is the special adaptation of orchard grass to this region. This grass seems to be especially hardy and well adapted to practically the entire Ozark country land and it is by far the most productive of all grasses on the drier lands.

Redtop has also shown itself very hardy on most of the soils, although it is not a very satisfactory grass when used alone. Bluegrass has been shown to be fairly well adapted practically everywhere, except on the drier lands where orchard grass is much to be preferred. Of the clovers, the red, alsike, and white have proven quite generally adapted to all but the driest lands, where their place will undoubtedly be taken by Japan clover.

"The results of the application of manure and fertilizers show a universal benefit from manure and almost a universal benefit from bone meal, while the dried blood does not seem to be a paying application; lime gave a return of consequence in only 1 instance."

From the results of field investigations among the farmers of 25 counties of the Ozark region, it was concluded that the matter of securing profitable pastures depended first, upon the permanent removal of undergrowth, and second, upon proper methods of pasture management, including the proper selection of grasses and clovers, as well as the method of seeding and handling. In removing the undergrowth, goats were deemed in general to be more economical, where it was possible to use them, than sheep or hand labor.

Mixtures of grass seeds for pasture purposes are given for the valley lands and include Kentucky bluegrass as the basis, timothy, and white or alsike clover. For the drier and more stony upland, orchard grass forms the basis of mixtures. Spring seeding is almost invariably to be recommended. A method described is the feeding of stock with hay, preferably a mixture of timothy and redtop, on the land to be seeded, this being aided by the tramping of the cattle.

A description of each of 13 varieties of the most useful grasses and clovers is given.

Some new grasses for the South, R. A. OAKLEY (*U. S. Dept. Agr. Yearbook 1912*, pp. 495-504, pls. 6).—This article discusses the methods of introduction and the usefulness of Rhodes, Sudan, and Tunis grasses, found in Africa. A description of these grasses and methods of their cultivation as forage and hay crops are given.

Grasses at Ruakura, A. W. GREEN (*Jour. New Zeal. Dept. Agr.*, 5 (1912), No. 3, p. 216).—This article gives *Bromus unioloides*, *B. carinatus*, *B. giganteus*, *B. pumpillaria*, *Alopecurus pubescens*, Wakeman fescue, and *Avena flavescens* as grasses that have made the most satisfactory winter growth in a variety test. In general frequent cuttings induced quick growth.

Cultivation of forage plants, L. MISSON (*Rev. Vet. e Zootech.*, 2 (1912), No. 2, pp. 97-101, pls. 6).—This paper discusses the cultivation and gives tabulated yields of numerous varieties of grasses, legumes, root crops, and miscellaneous crops harvested near Rio Janeiro in 1908, 1909, and 1911. Yields of green forage ranged from 5,554 to 259,740 kg. per hectare (from 2.47 to 115.58 tons per acre).

Cereal experiments in the Texas Panhandle, J. F. ROSS and A. H. LEIDIGH (*U. S. Dept. Agr., Bur. Plant Indus. Bul.* 283, pp. 79, figs. 13).—In this bulletin the authors discuss conditions in the Panhandle, including meteorological observations, and report experimental work begun in 1903 and carried on at 4 different points.

Results obtained at Channing, Hartley County, in 1905 and 1906 "show that hard red winter wheats, black winter emmer, and winter rye gave profitable yields. Among spring wheats Galgalos and Chul (common) wheats and Kubanka (durum) wheat were the best yielding varieties, but none of them equaled the winter varieties. Early oats like Burt, Red Rustproof, and Sixty-Day gave only fair yields and later varieties still smaller. No spring barleys did well.

"The date of seeding and rate of seeding tests were of too short duration to yield conclusive results, as were also the tests of the comparative value of fallowing and continuous cropping.

"In a test of many varieties of corn the average yield of the best variety in a 3-year period was less than 40 per cent of the yield of milo maize. Milo maize and Kafir corn proved good yielders of grain, the 3-year average yield of milo being 42 bu. of 56 lbs. each.

"Experiments were begun at Amarillo in 1905 and transferred to the new farm at that place in 1909. Very extensive experiments, partly cooperative with other offices, have been conducted since the latter date.

"Hard red winter wheats of the Turkey group and medium-hard sorts of the Mediterranean group have proved best adapted, giving yields of 7.5 to 10.5 bu. per acre for the 6-year period ended in 1911. The best varieties of winter spelt and emmer have yielded 25 and 19.6 bu., respectively, in the same period.

"Tennessee winter barley gave an average yield in the 6-year period of 10.6 bu., and the best winter rye 9 bu., but no varieties of winter oats have proved sufficiently winter hardy.

"Experiments in dates and rates of seeding of winter wheat show that 3 pk. per acre sown between October 15 and 30 gave the best average results. Cultural experiments indicate that best results will be obtained when the land is plowed at least 6 in. deep from 60 to 80 days before seeding. When the land can not be prepared until nearly seeding time disking has given better results than plowing.

"Spring wheats have been somewhat lower in yield than winter wheats. The best varieties were the common wheats, Fretes and Galgalos, yielding 9.3 bu. on the average, and the durum wheats, Marouani, Saragolla, and Kubanka, yielding 8.7, 8.6, and 7.9 bu. per acre in the order named.

"Experiments indicate that 4 pk. per acre for the common spring wheats and 5 pk. per acre for durum wheats are the best average rates of seeding, subject to variation with varying weather and soil conditions. The best date of seeding varies from the last of February to the middle of April, depending on conditions of weather and soil moisture.

"The spring oat varieties, Red Algerian and Red Rustproof, have yielded 19.8 and 18 bu., while different strains of Sixty-Day, Kherson, and Burt have varied between 13.6 and 17.8 bu. for the 6 years from 1906 to 1911. Results of rate of seeding tests have been contradictory, indicating that the proper rate is governed by weather and soil conditions. However, 5 pk. is probably the best rate for average conditions. Early or medium early seeding is usually to be recommended. Fall plowing for spring oats has been found most desirable, and home-grown seed has given better results than seed of the same variety brought from a distance.

"Spring barley has not given profitable yields, the best variety being the White Hooded, yielding from 5 to 7 bu. in the 6-year average.

"Proso (broom-corn millet) varieties have produced average yields of 10.7 to 13 bu. per acre in tests lasting from 4 to 6 years.

"The results in tests of corn during the 6-year period show it not to be adapted to the Panhandle country. The best variety, a June corn, yielded 11.8 bu., and only 3 varieties exceeded 8 bu. per acre on an average during that time. Omitting the results of 1 season, a locally grown red dent has yielded slightly better than the June corn.

"The grain sorghums are the most dependable crops that can be grown in the Panhandle. In the 5 years, 1907 to 1911, inclusive, the average yields of all varieties of milo maize were 23.5 bu., while all varieties of dwarf milo maize in

the last 4 years of this period yielded an average of 27.8 bu. Blackhull and Red Kafir corn made an average yield of 20 bu. in the 6-year period, 1906 to 1911, excluding 1907 in the case of Red Kafir. Varieties of durra and kaoliang also made good yields. About 3 lbs. per acre is the proper rate of planting and the best date in the vicinity of Amarillo is about May 20, varying, however, with the season.

"Dwarf broom corn is suited to the region, but requires judgment and experience to make production profitable. It should be grown only by farmers who expect to continue growing it for a period of years and who can afford the necessary equipment to handle it properly.

"Smuts of cereals are fairly common, but all destructive smuts can be easily controlled by proper treatment of the seed.

"Grain sorghums such as milo maize, dwarf milo maize, and Blackhull Kafir corn have given profitable yields at Dalhart, though not so high as at Amarillo. The small grains, both winter and spring varieties, have been so damaged by winterkilling, spring blowing, drought, and hail, as to show no profitable yields during the period covered by the experiments.

"Experiments with small grains have been conducted cooperatively with the Office of Forage Crop Investigations at Chillicothe, which is situated in Hardeman County, somewhat east of the true Panhandle, at an elevation of only 1,500 ft. and with an average annual rainfall of 23 in. The results are similar to those obtained at Amarillo, the hard winter wheats giving the best yields and proving the most profitable small-grain crop. The grain sorghums are important and completely adapted crops, milo maize, dwarf milo maize, and Blackhull Kafir corn being largely and profitably grown."

The chemical composition of atavistic beets, J. URBAN (*Ztschr. Zuckerindus. Böhmen*, 37 (1912), No. 2, pp. 57-65).—This paper gives the results of an investigation of red beets of the stock beet form, red beets of the sugar beet form, salad beets, and degenerated white sugar beets that were found in a field of sugar beets. It was found that the red beets, which were the result of self-fertilization among pure-bred sugar beets, held an intermediate place between sugar beets and stock beets in sugar content, dry matter, and chemical composition.

Cotton, W. H. SCHERFFIUS (*Agr. Jour. Union So. Africa*, 3 (1912), No. 5, pp. 603-624, figs. 9).—This article discusses cotton culture, including soils, good seed, and cost of production. Tabulated results are given of variety tests with American Upland, Sea Island, Egyptian, and Caravonica. A 5-year rotation practiced consists of first year, cotton; second year, legumes; third year, maize (and a winter crop of cereals); fourth year, tobacco; and fifth year, cotton.

Liming soil for cotton resulted in increased yields in nearly every case, the best yield being 1,718 lbs. seed cotton per acre.

Improved methods of handling and marketing cotton, C. J. BRAND (*U. S. Dept. Agr. Yearbook 1912*, pp. 443-462, pls. 4).—This article discusses cooperative organizations among cotton growers, their forms, and methods of operation. Provision for storing seed cotton on the farm is recommended as of benefit in strengthening the fiber, improving its luster, and as an economic use of labor. It is claimed that a higher yield of lint is secured after storing, owing to cleaner ginning from the seed. The economy of holding cotton for 6 months by the farmer; more careful ginning and cleaning; the inadvisability of selling cotton in the seed; irregularities in weighing; moisture in cotton; and standards and grading are also discussed. The advantages of compressing, as well as of some automatic means of sampling at the gin, are mentioned.

The gin plant is regarded as the vital point in the cotton-handling situation. "Well-organized, responsible cooperative growing and handling associations, acting in concert with the other elements of the cotton trade, can ultimately bring about improvements that will save millions of dollars."

Cotton growing in Egypt, A. SCHMIDT (*Manchester, London, and Reddish* [1912], pp. 73, pls. 3, figs. 17).—This publication is a report of the author's visit to Egypt, and covers soil, population, labor, land values and taxes, methods of cotton cultivation, kinds of cotton, irrigation systems, drainage, ginning, the cotton market, yields, causes of deterioration, distribution of seed, and rotation.

Cotton growing in India, A. SCHMIDT (*London, Manchester, and Reddish* [1912], pp. 113, figs. 19).—This publication is a report of the author's second visit to India, and covers soils, methods of cultivation, kinds of cotton, water supply, manuring, rotation of crops, insect pests, buying agencies, cotton markets, ginneries, land tenure, wages, and seed farms, with chapters on the work of the agricultural department in the United Provinces in connection with the culture of cotton, and gives tables showing the commercial classification of the principal Indian cottons.

Report on the flax experiments conducted at Dooriah during the year 1911-12, E. M. VANDEKERKHOVE (*Agr. Research Inst. Pusa Bul. 30, 1912*, pp. 8).—This bulletin gives the results of trials in growing flax and producing the fiber during 1910, 1911, and 1912, covering both yields and cost of production. A profit of 63 rupees (about \$20) per acre was secured in 1912.

The culture of lupines and mustard, J. DUMONT (*Ann. École Nat. Agr. Grignon, 2* (1911), pp. 70-73).—In a continuous cropping experiment with lupines and mustard the yields per hectare were gradually reduced from 12,250 kg. in 1905 to 480 kg. in 1909 with lupines, and from 19,250 to 11,915 kg. with mustard. The author concludes that a toxic effect of the residue left by the plants causes such an influence on the soil bacteria as to result in crop reduction.

On the growth of orchard grass and tall oat grass with from 2 to 6 cuttings during the season, E. LINDHARD (*Tidsskr. Landbr. Plantæavl, 19* (1912), No. 4, pp. 653-672).—It is noted that the time of the first cutting and the number of cuttings in the course of the summer exert a very important influence on the yield and the quality of the crop harvested.

The yield was largest with a late first cutting (July 1) and only 2 cuttings during the season. When the first cutting was made earlier and the number of cuttings was increased the yield was greatly reduced. By taking the first cutting 6 weeks earlier, followed by 5 more cuttings, the total yield of hay was not one-half as large as in the case of 2 cuttings, although the nitrogen content of the hay was increased from below 1 per cent to above 2.5 per cent. Too frequent cuttings may also weaken the plant growth during the following season. Frequent cuttings give a juicy and nutritious feed but only small yields, while late cuttings give a large yield of hay, which in extreme cases approaches straw in character.

Influence of hilling on the yield of potatoes, J. DUMONT (*Ann. École Nat. Agr. Grignon, 2* (1911), pp. 68-70).—Experiments in hilling and ridging potatoes resulted in yields of 22,000 kg. per hectare (19,580 lbs. per acre) with shallow hills, 28,000 kg. with high hilling, 21,500 kg. with shallow ridging, and 26,800 kg. with high ridging.

Experiments with root crops, L. HELWEG (*Tidsskr. Landbr. Plantæavl, 19* (1912), No. 4, pp. 561-594).—The experiments were conducted during the seasons 1907-1910 at Danish plant culture stations along the lines given below.

As to early and late thinning of ruta-bagas and carrots, the yields were decreased by about 20 per cent when the thinning was postponed until the plants

were from 6 to 8 in. high in the case of ruta-bagas, and from 4 to 6 in. in the case of carrots; for every day the thinning is postponed the decrease in the yield of ruta-bagas (as in the case of mangels and turnips) may be estimated at 1 cwt. of dry matter per tündeland (1.36 acres), and that of carrots at $\frac{1}{2}$ cwt. The percentage of dry matter was not affected by the time of thinning, but only the gross yields of roots. If carrots are grown for feeding, roots and tops, the thinning should be finished before the plants have, in general, 3 complete leaves besides the cotyledons.

The conclusions drawn from the experiments on distance of sowing root crops were that when the work in the root field is crowding, it is advantageous to give the mangels a distance of from 22 to 24 in. between the rows and from 8 to 10 in. between the plants in the row, and ruta-bagas from 24 to 26 in. between the rows, with 15 in. between plants in the row. On the other hand, when the farmer can easily take care of the work in the beet field in due season, and where the question of complete eradication of weeds is not vital, the distance of sowing, especially of mangels, may preferably be reduced 2 in. between the rows. For carrots a distance of 21 in. and no thinning was found advantageous under all conditions.

The results showed that the percentage of dry matter in roots grown on the same land decreased regularly with increased size of the roots, and that the decrease in dry substance for every pound of increase in the weight of the roots is largest for roots of a high dry-matter content and smallest for roots of a lower dry-matter content, being about 0.9 per cent per pound of increase in the former case, and from 0.5 to 0.6 per cent in the latter.

The effects of different methods of thinning on the yields of roots with large and with small tops were studied in a number of trials during a series of years, and the results are presented and discussed.

Cooperative tests with soy beans in 1912, C. G. WILLIAMS and F. A. WELTON (*Ohio Sta. Circ. 132, pp. 41-51*).—This circular gives the results of tests and trials by 32 cooperators in 21 counties. Yields from acre trials ranged from 8 to 28 bu. of seed per acre, and in variety plat tests as high as 50 bu. per acre was reached. The dates of planting ranged from May 20 to June 21, and some of the largest yields were obtained from about the middle of June plantings. The amount of seed varied from 2 to 8 pk. per acre, the maximum yield being secured from about 3 pk. of seed. Tables give some of the data obtained in the tests and trials.

Sugar beet culture in England, A. HALSTEAD (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 87, p. 267*).—This article reports a heavier total yield of sugar beets and larger quantities of sugar per acre in Cornwall for a series of years than in other parts of England or on the Continent. These estimates were based upon results of cooperative experiments with about 300 farmers, and on areas ranging from $\frac{1}{2}$ to over 5 acres each.

Sugar beet investigation in the Cape Province, C. F. JURITZ (*Agr. Jour. Union So. Africa, 3 (1912), No. 6, pp. 767-777, fig. 1*).—This article discusses the sugar beet investigations begun in 1897, and gives mechanical and chemical analyses of 2 classes of soil upon which beets were grown, and measurements of beets and analyses. The sugar content ranged from 6.33 to 17.57 per cent, depending upon size and location.

The world's cane-sugar industry, past and present, H. C. PRINSEN GEERLIGS (*Altringham, England, 1912, pp. XVI+399, pls. 20, figs. 7*).—In this book the author has endeavored to bring together in a coherent survey the past, present, and probable future of the sugar-cane industry in the different countries of production. As among the most conspicuous causes which have contributed to giving this industry new vitality are mentioned the Brussels Con-

vention, the conquest of Formosa by the Japanese, the tariff privileges granted by the United States to the former Spanish colonies, and the great advance of science in the province of sugar-cane culture and cane-sugar manufacture. The subjects covered are general history of the cane-sugar industry and the condition of the cane-sugar industry in the different countries of production, including data as to planted area and total production, cane cultivation, sugar manufacture, prime cost, importation, transportation, excise duties, and the future.

Wheat experiments on the botanical areas, Cawnpore, and their bearing on wheat cultivation in the United Provinces, H. M. LEAKE and R. PRASAD (*Agr. Research Inst. Pusa Bul. 31, 1912, pp. 17*).—This paper gives results of variety tests of wheat under various cultural methods. Deep plowing immediately after harvest, to provide for the penetration of the rain water before the next crop was planted, proved most satisfactory.

Mutation in a variety of pure-bred wheat, N. PASSERINI (*Bul. Soc. Bot. Ital., 1912, No. 1, pp. 8-10, fig. 1*).—This paper compares the differences in the parts of the spike of a pure-bred variety and a mutation of that variety.

Asepticizing pure seeds, V. M. ARCCHOVSKY (*Zap. Sta. Isp. Sîem. Imp. Bot. Sad. (Ann. Samenprüf. Anst. K. Bot. Gart. St. Petersburg.), 1 (1912), No. 6, pp. 15*).—From investigations described in this bulletin it was concluded that seeds from healthy fruit may be considered free from micro-organisms. That sterilized seeds were aseptic was proven by placing them for 14 days in a culture bouillon.

Danish seed control, 1911-12, K. DORPH-PETERSEN (*Tidsskr. Landbr. Plan-teavl, 19 (1912), No. 4, pp. 676-717*).—This is the forty-first annual report of this institution and contains résumés of the work during the year, with discussions. The number of seed samples examined during the year was 11,458, of which 5,786 samples were forwarded by seedsmen.

A new weed exterminator, J. C. ARTHUR (*Science, n. ser., 37 (1913), No. 940, p. 19*).—This article describes the application of orchard heating oil in the destruction of wild garlic (*Allium vineale*), as tested by the Indiana Experiment Station. This oil destroyed the bulbs in the soil, as well as the bulblets on the stalk; in fact, it seemed to kill all growing vegetation, but appeared to have no lasting effect on the soil.

HORTICULTURE.

Hybridization experiments with stocks, peas, and beans with reference to the theory of factors, E. VON TSCHERMAK (*Ztschr. Induktive Abstam. u. Vererbungslehre, 7 (1912), No. 2, pp. 81-234, pls. 4, figs. 4*).—In the experiments here described the author first analyzes in detail the nature of factor transmission in his various hybrid forms of stocks, peas, and beans, which have previously been described empirically (*E. S. R., 16, p. 263*), these data being supplemented by the results of recent observations. He then deducts hypothetical factor formulas for the various forms and breeds involved, after which he sets out to test these formulas by a new series of experiments in which the individual hybrid offspring are recrossed with the parent forms, with each other, and with other stocks and hybrids having known factor combinations. The results of these check tests are discussed at considerable length, special attention being given to certain factors which in the recrosses failed to conform to the hypothetical formulas and to a study of accelerating and restricting factors. Frequent reference is made to the work of other breeders.

The author's results and deductions are reviewed in the concluding chapter. He finds in substance that the methodical analysis of numerous cases of systematical crosses of stocks, peas, and beans has shown that the majority of

these crosses are capable of rational interpretation without any complication, through the recognition of independent or separable character causes or factors, which are present in one parent and absent in the other, or are common to both. The theory of factors (Faktorenlehre) has shown itself to be a very useful hypothesis.

The author is of the opinion that the theory of factors in no way supersedes or renders superfluous the theory of cryptomery.^a On the contrary this only needs amplification as having possession of hidden but nevertheless reactionary factors which, in consequence of altered grouping (working in combination with other factors or separating from such), are able to postulate obvious newly appearing characters.

The author's studies are to be continued with the aim of perfecting the theory of factors.

The chemistry of the floral pigments, P. Q. KEEGAN (*Chem. News*, 107 (1913), No. 2786, pp. 181, 182).—A discussion of the origin of colors in flowers in which special consideration is given to the chemical origin of the true blue pigment. The author concludes, as a result of his own researches combined with those of others, that a particular tannin termed caffetaunin is the actual chromogen of the true blue pigment of flowers.

Recent investigations on Brassica grafts, L. DANIEL (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 2, pp. 151, 152).—A study of grafts made between various cultivated species of Brassica leads the author to conclude that with Brassica grafts the reserve material accumulates only in the parts of the plant adapted by heredity to the function of reserve. The specific rhythms of development and of tuberculization made in certain races of Brassica vary profoundly under the influence of grafting. A monocarpic biennial Brassica with a single colored inflorescence and tuberculization may be transformed through grafting to a polycarpic plant with many colored inflorescence and tuberculization.

The author further concludes that these changes are readily explained through the hypothesis of graft variation (E. S. R., 14, p. 654) but can not be explained through the contrary hypothesis of immutability of stock and scion (E. S. R., 22, p. 732).

Hybridization experiments with peppers, GRIFFON and PICHENAUD (*Ann. École Nat. Agr. Grignon*, 3 (1912), pp. 63-72, figs. 6).—In 1908 the authors crossed a long black Mexican pepper with a sweet American pepper of the bull-nose type.^b The present paper comprises a study of the offspring as continued by Moreau and Pichenaud, including a review of the earlier work.

Tomato investigations, J. G. BOYLE and J. B. ABBOTT (*Indiana Sta. Bul.* 165, pp. 789-830, figs. 18).—In continuation of previous investigations on tomato growing (E. S. R., 24, p. 39) work was begun in 1910 and continued through 1911 and 1912 to determine the relation of the following factors to economic tomato production for canning purposes: Source of seed supply, varieties, methods of starting and handling seedling tomato plants before setting in the field, cultivation, and spraying for the control of leaf spot. Fertilizer experiments have also been conducted during the past 5 years. The result of these investigations are here discussed in detail.

A test of 12 strains of Stone tomato seed secured from 8 prominent seed houses showed considerable variation in yield and in the bearing season of the strains. No definite conclusions are drawn as to the best source of tomato seed. It appears, however, that regardless of the location of the seed houses

^a Bot. Centbl., Beihefte, 16 (1904), No. 1, pp. 11-35.

^b Ann. École Nat. Agr. Grignon, 1 (1910), p. 116.

a large percentage of the tomato seed now offered is grown in Michigan where the climate and soil are well adapted to its production. Suggestions are given for the annual selection of seed, looking to the development of high-producing strains of local origin.

Tomato varieties were found to vary widely in prolificacy. The 6 highest yielders for the 3 test years were Greater Baltimore, Favorite, Royal Red, Chalk Early Jewel, Paragon, and Trophy.

Hotbed grown plants produced about twice as much fruit as those started in a seed bed in the open ground. Transplanting once or twice in flats gave a larger yield than planting directly from the hotbed soil. The most profitable method for starting seedling plants consisted in sowing the seed in wood veneer bands in the hotbed and shifting the plants to the field at setting time with band and soil intact. Plants started in a seed bed in the open ground gave estimated returns, less the cost of growing the plants, of \$51.30 per acre, as compared with \$140.40 per acre for plants hotbed grown in veneer bands and set out without transplanting.

A comparison between average and thorough cultivation for the 3 years' work indicates that thorough cultivation will generally give a much higher net profit per acre. Tomato leaf spot (*Septoria lycopersici*) was readily controlled by spraying with Bordeaux mixture.

As a result of the fertilizer investigations the station recommends for tomatoes 500 or more pounds per acre of fertilizer containing 2 per cent of nitrogen, one-half derived from nitrate of soda and one-half from high-grade organic sources; 10 per cent of available phosphoric acid; and 6 per cent of potash, derived from sulphate of potash.

The effect of fertilizers on variation in corn and beans, J. K. SHAW (*Amer. Nat.*, 47 (1913), No. 553, pp. 57-64, figs. 2).—The data here reported were secured in the summer of 1909 from a field of sweet corn and beans, which was fertilized with nitrogen, phosphorus, and potash, separately and in combination. The original purpose of this study was to investigate the possible inheritance of variations caused by fertilizers. On account of other work no test was made of the progeny, hence the present data merely show the variations in yield of the corn and beans, as well as the variations in stature of corn plants.

Nitrogen was found to be the deficient element in the corn plats. The greatest benefit both in reduction of barren stalks and production of 2-eared stalks of ear-bearing suckers was secured on the plat on which a complete fertilizer was used in conjunction with manure. Neither potash nor phosphorus showed any beneficial results when used alone and a complete fertilizer gave better results than a combination of any 2 of the elements. The results with reference to plant stature conform, generally speaking, with those secured for yield, although the addition of the mineral elements, especially if nitrogen was also supplied, appeared to raise somewhat the height of the uppermost ear in 2-eared stalks.

In the case of the beans potash was most effective in increasing the mean number of pods per vine. Nitrogen was next in its effect and there is a possible beneficial effect from phosphorus. A complete fertilizer was still more effective, and manure with a complete fertilizer gave the best results. A few of the bean plants, however, did not appear to be benefited.

The California vegetables in garden and field, E. J. WICKSON (*San Francisco*, 1913, 3. ed., rev. and enl., pp. VIII+326, figs. 19).—The present edition of this work (E. S. R., 24, p. 339) has been revised and extended to include up-to-date information on the subject.

Lists of publications on vegetable topics, T. GREINER (*N. Y. State Veg. Growers' Assoc. Rpt., 1911-1913, pp. 215-225*).—This list, which is compiled on behalf of the New York State Vegetable Growers' Association, comprises books, publications, bulletins, etc., dealing with the general principles of vegetable growing, insects, diseases, spraying, botany, breeding, canning, etc., together with literature dealing with the culture of special crops.

Difference in varieties of fruit and truck crops with reference to disease, J. B. S. NORTON (*Rpt. Md. State Hort. Soc., 15 (1912), pp. 62-67*).—Data are given on observations of a number of varieties of apples with reference to their injury from cedar rust, scab, blight, and russet from Bordeaux spraying, together with data on the susceptibility of different varieties of tomatoes planted on soil infected with *Fusarium* wilt disease.

An examination of the data secured for the resistance of apple varieties indicates that freedom from one disease apparently has nothing to do with freedom from other diseases, though a considerable number of varieties were affected with both rust and blight. As indicated by the data there appears to be considerable variation in the susceptibility of different varieties of tomatoes to the *Fusarium* wilt. Certain varieties were practically immune and others resisted attack until late in the season.

Disease susceptibility of apple varieties in Ohio, A. D. SELBY (*Ohio Sta. Circ. 133, pp. 53-56*).—The author has here compiled in tabular form a comparative summary of the relative susceptibility of different varieties of apples to the diseases crown gall, collar rot, blister canker, twig blight, scab, bitter rot, blotch, black rot of fruit and canker of branch, physiological fruit spot, and fungus fruit spot. Notes are also given showing the special weaknesses of different varieties.

Spraying: New methods, materials, and ideas, O. S. WATKINS (*Trans. Ill. Hort. Soc., n. ser., 46 (1912), pp. 76-85*).—This is a discussion of the author's experience with fall and spring sprayings and five regular summer sprayings of apples, designed to protect against insects and fungi.

It is stated that high pressure spraying causes much injury to the fruit and leaves by forcing the granular particles of lime through the epidermis, making an opening for copper which is said to be injurious. It is thought that 125 lbs. is as high a pressure as is safe to use. The removal of every apple at harvesting is considered necessary to prevent diseases being carried over to the next crop.

Promising new fruits, W. A. TAYLOR and H. P. GOULD (*U. S. Dept. Agr. Yearbook 1912, pp. 261-278, pls. 8*).—In continuation of similar articles (*E. S. R., 27, p. 537*) historical notes with descriptions and color plates are given of the following new or little-known fruits and nuts that are considered worthy of more extensive trial: Eastman, Monocacy, and Summer King apples; Douglas pear; Chesapeake strawberry; Ormond persimmon; Pollock avocado; and Major, Burkett, Warrick, Havens, and Owens pecans.

The precooling of fruit, M. COOPER (*Cold, 4 (1913), No. 10, pp. 183-189, figs. 2*).—A descriptive account of the car and warehouse precooling methods as recently developed in the United States.

[On the lateral shoot-forming tendency of various kinds of fruit trees], O. SCHINDLER (*Ber. K. Lehranst. Obst u. Gartenbau Proskau, 1911, pp. 27-29, figs. 2*; in *Landw. Jahrb., 43 (1912), Ergänzungsbl. 1*).—Lists are given of varieties of apples and stone fruits which were found to have a special tendency toward lateral shoot development, together with those which developed only a relatively small number of lateral shoots and those in which lateral shoot development was almost absent.

On the root development of fruit trees, K. KROEMER (*Ber. K. Lehranst. Wein, Obst u. Gartenbau Geisenheim, 1911, pp. 162-170; Landw. Jahrb., 43 (1912), Ergänzungsbl. 1*).—A discussion of this subject based on investigations conducted at the plant physiological experiment station at Geisenheim.

Investigations on the germination of pollen of fruit trees, A. MANARESI (*Staz. Sper. Agr. Ital., 45 (1912), No. 11, pp. 809-873*).—The studies here reported were conducted during the 3 seasons, 1910 to 1912. The pollen was secured from fruit blossoms of various species and germinated principally in sugar solutions. Among the objects of the investigations was an attempt to define the action of stigmas reported by Richer, who found that many kinds of pollen which could not be made to germinate either in water or sugar solutions readily sent out their pollen tubes when fragments of stigmas of the same or nearly related species were added to the cultures (*E. S. R., 14, p. 1046*). Studies were also made of the best conditions for germinating pollen in artificial cultures and of diverse germinating power among different varieties. The author's results are presented in a series of tables and discussed.

It is concluded from the investigations that the presence of pieces of fresh stigmas in the culture results in a greater rapidity of germination and of growth in the pollen tube and also in a greater germination of the pollen itself. If the fragments are not fresh, on the other hand, germination may be either retarded or prevented. Fresh stigmas of another variety or of another species are preferable to dried stigmas of the same kind as the pollen. The author is unable to explain the nature of this action of the stigma on the pollen, although it is suggested that it may be due to the secretion of one or more substances which stimulate the pollen. Stigmas which were immersed in water from 15 minutes to 16 hours still exerted a more or less favorable action on germination.

The author found a 10 to 15 per cent saccharose solution satisfactory for the majority of cases, although some pollens germinate well in a 30 per cent solution. The best germination temperature appears to range around 15° C. With average conditions germination is completed in from 6 to 12 hours. Strongly concentrated solutions retard germination.

Pollen germination was quite variable not only between species but between varieties. Germination in any one year was fairly constant between different plants of the same variety, which leads the author to conclude that good or poor pollen germination in a sugar solution is a varietal characteristic. Pollen from vigorous trees germinated better than pollen from diseased trees.

A bibliography of pollination literature is given.

The frost resistance of apricot and peach pollen, R. EWERT (*Ber. K. Lehranst. Obst u. Gartenbau Proskau, 1911, pp. 83-85, in Landw. Jahrb., 43 (1912), Ergänzungsbl. 1*).—In the author's experiments, here briefly noted, several samples of pollen from apricot and peach blossoms were submitted to temperatures ranging from -8 to -15° C. for periods of from 2 to 3 hours. The results, although not uniform, indicate that both apricot and peach pollen have a relatively high resistance to cold.

Factors influencing the formation of fruit buds in apple trees, B. S. PICKETT (*Trans. Mass. Hort. Soc., 1913, pt. 1, pp. 57-72*).—This is largely a review of experiment station literature on the subject.

The fertilization of apple orchards, J. P. STEWART (*Pennsylvania Sta. Bul. 121, pp. 3-28, pls. 4, figs. 2*).—This bulletin reviews the more practical results of the author's orchard fertilizer investigations (*E. S. R., 28, p. 143*) and also contains data on the fifth year's experiments in some of the orchards. It largely displaces Bulletin 100 of the station (*E. S. R., 23, p. 341*).

In the experiments as a whole it has been found that variations in fertilization alone have resulted in average differences ranging from 50 to 460 bu. per

acre annually for the past 4 or 5 years, depending on the experiment. The fertilizers that have materially increased the yields have also increased wood growth, unless either has increased to an abnormal extent. Phosphates seem to be a partial exception to this rule, and mild injuries also may stimulate yield at the expense of wood growth.

The following table shows the average benefits over normal results without fertilization for the period 1908 to 1912, inclusive:

Influence of fertilizer elements on apples.

Fertilizer treatment.	Yield.	Color.	Size.	Growth.
<i>Series A.</i>				
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Nitrates in combination.....	62.7	-11.6	-0.7	10.43
Nitrates alone.....	32.5	-12.7	-4.3	15.51
Phosphates in combination.....	20.2	-2.1	0.3	2.28
Phosphates alone.....	-10.7	2.7	-0.6	2.45
Potash in combination.....	15.1	3.2	5.8	3.67
Complete fertilizer.....	78.3	-15.4	5.2	17.67
Manure.....	75.9	-11.4	5.8	29.07
Lime alone.....	-8.24	-0.3	-2.0	6.31
<i>Series B.¹</i>				
Nitrates in combination.....	74.5	-12.7	-0.4	27.00
Phosphates in combination.....	33.5	-2.8	4.9	-0.23
Potash in combination.....	-3.6	1.4	7.1	2.79
Complete fertilizer.....	80.5	-15.6	5.2	29.63
Manure.....	168.8	-15.9	25.2	37.34
Lime alone.....	29.8	-5.4	15.9	15.48

¹ Results for color and size for 1909-1912.

The value of different elements varies for different orchards, and in one experiment no form of fertilization has yet shown a profitable response. The influence of proper fertilization, however, has thus far been continuous, with a tendency toward maintaining a steady annual yield, except where the yields of the previous year were abnormally high.

Contrary to the results secured at the Massachusetts Station (E. S. R., 23, p. 342) with low-grade sulphate, high-grade sulphate in the Pennsylvania work has shown no superiority over muriate as a carrier of potash, the reverse being usually true. The author suggests that the low-grade sulphate used in the Massachusetts work may have proved superior on account of its magnesia content.

Owing to the retarding influence of nitrogenous fertilizers or manure on color, it is advised that they be used less freely on some red sorts, especially those which are tardy in coloring up, such as the York Imperial. This precaution is less important on the lighter soils and in localities with long growing seasons. Present evidence indicates that the nitrates, or other specially soluble plant foods, are best applied somewhat after the fruit has set. In addition to greater effectiveness the rate of application may be varied to conform to a certain degree with the amount of fruit set, thus tending to steady the yield.

The author concludes that the actual fertilization of a given orchard is still largely a local problem. A local testing plan is here submitted. In lieu of such a test a general fertilizer, based on the experimental results, is recommended for bearing trees, as follows: Nitrogen 30 lbs. per acre, carried as 100 lbs. nitrate of soda and 150 lbs. dried blood or 150 lbs. ammonium sulphate; phosphoric acid 50 lbs., carried as 350 lbs. acid phosphate, 200 lbs. bone meal, or 300 lbs. basic slag; and from 25 to 50 lbs. potash, carried as 50 to 100 lbs. muriate or 100 to 200 lbs. low-grade sulphate. For young trees these amounts

may be reduced to correspond as far as possible with the area in which the lateral distribution of roots occurs.

Cost of producing apples, B. J. CASE (*N. Y. Dept. Agr. Bul. 35, 1912, pp. 907-912*).—This comprises a detailed report for 6 seasons on the cost of production and returns from a 150-acre diversified fruit farm. In addition to the figures for apples data are also given for peaches, pears, plums, grapes, and cherries.

Strawberries, J. OSKAMP (*Indiana Sta. Bul. 164, pp. 753-785, figs. 22*).—Part 1 of this bulletin contains practical directions for the culture and care of a strawberry planting. Part 2 contains detailed descriptions of some 129 varieties of strawberries fruited at the station in 1911 and 1912. Selected lists are given of varieties found to be superior to others in their season and of varieties which were above the average of those tested.

Strawberries, J. OSKAMP (*Indiana Sta. Bul. 164, popular ed., pp. 3-8, figs. 18*).—A brief popular edition of the above bulletin.

The function of grape foliage in relation to the grapes, A. MARESCALCHI (*Staz. Sper. Agr. Ital., 45 (1912), No. 12, pp. 940-944*).—A test, conducted for one season only, in which the leaves were completely stripped from some fruiting grape canes throughout the entire growing season, appears to indicate that the current year's foliage exerts only a moderate influence on the development of the fruit. The fruit showed a slight decrease in sugar content and a similar increase in acidity. The must of the fruit from the defoliated canes, however, was lacking in color.

The author calls attention to the need of more definite information relative to the physiology of the grape and suggests some lines along which investigations might be conducted.

The Valencia raisin industry (*Jour. Roy. Soc. Arts, 61 (1913), No. 3160, pp. 754-756*).—In this article special attention is given to the methods of curing raisins in the Valencia district.

Statistics on the production of grapes and olives in 1912 (*Estadística de las Producciones Vitícola y Olivarera en el Año 1912. Madrid: Gort., 1913, pp. 9*).—A statistical review of the production of grapes, wine, olives, and olive oil in the regions and Provinces of Spain for the year 1912.

Selection among cultivated crops with special reference to coffee, J. KUIJPER (*Dept. Landb. Suriname Bul. 30, 1913, pp. 14-29, fig. 1*).—The author discusses selection as a means of crop improvement and outlines a method of selection for the improvement of coffee.

The cost of making copra (*Trop. Life, 9 (1913), No. 6, pp. 103, 104*).—A discussion relative to the various cost factors entering into the production of copra, based on information secured by *Tropical Life* from various sources.

Commercial studies with the date, A. E. VINSON and C. N. CATLIN (*Arizona Sta. Rpt. 1912, pp. 701-706*).—During the date harvest of 1912 the processes of artificial ripening (*E. S. R., 27, p. 539*) were studied under commercial conditions; experiments in pasteurizing dates were started; and observations were made relative to the adaptability of different varieties to climatic conditions in the Salt River Valley.

As far as observed the best varieties for the region reacted well to chemical methods of ripening. The less reactive varieties, especially Deglet Noor, gave larger yields by the heat process. Fruit was ripened with carbon dioxid as successfully as with acetic acid or with nitrous ether. It is believed that the carbon dioxid method may prove a little more expensive but will be free from all objections so long as it is applied only to fruit that has reached a sufficient degree of maturity. After the fruit has been stimulated by carbon dioxid,

the application of gentle warmth greatly shortens the time required for perfect ripening. By combining these methods Rhars dates removed green from the tree were marketed in less than 48 hours.

In the case of Rhars and many of the best varieties for the region, artificial methods of ripening are used with best success in ripening the remaining green fruit after most of the fruit has ripened naturally. Immature green fruit must be dried somewhat to insure reasonable keeping qualities. Dates ripened artificially at the end of a prolonged dry period keep better than those ripened after a rainy period. When partially ripened Rhars dates are caught by wet weather and sour, they may be separated from the good dates by shaking the bunches.

In so far as the varieties adapted climatically to Salt River Valley were concerned, artificial ripening was of secondary importance. The real drawback to the immediate success of the fresh date industry was the insects which infest the date in the orchard and the poor keeping quality of many varieties. A preliminary experiment in pasteurizing dates indicates that a temperature of 65 to 70° C. maintained for 2 or 3 hours may be effective in destroying insects and their eggs without seriously impairing the natural flavor of the fruit. Dates treated in this manner were free from insects and showed excellent keeping qualities. Work will be continued along this line.

As a result of the investigations to date, it appears from an economic standpoint that the date industry in Arizona can hardly compete with the dried date industry in the Old World and should be largely confined to the production of fresh dates for which there is a ready demand. It is not considered likely that fresh dates will stand ocean transportation since they mold soon in cold storage.

Of the trees in the Tempe orchard, the most numerous are Rhars, Birkets, and Deglet Noors. Of these Birket el Haggi thus far gives the most promise for the fresh date industry in the Salt River Valley, although a number of other varieties here noted are considered worthy of trial.

The rapid curing of lemons, W. SNODGRASS (*Cuba Mag.*, 4 (1913), No. 11, pp. 512-514).—The process here described consists in submitting the lemons to alcohol fumes in a closed room for a period of from 2 to 2½ days, after which time the lemons continue coloring without more alcohol. This method, as tried out by the author and C. D. Abbey last year, is said to have given satisfactory results.

The California lemon industry, G. H. POWELL and F. O. WALLSCHLAEGER (*Citrus Protect. League Cal. Bul.* 9, 1913, pp. 59).—This comprises the results of a detailed survey of the California lemon industry conducted under the direction of the Citrus Protective League of California. Statistics are given relative to the development and present status of the industry, including cost data on practically every phase of production, handling, and marketing, together with comparative data showing the respective positions of the Italian lemon industry (*E. S. R.*, 28, p. 437) and the California lemon industry in supplying the American trade.

Note on the tea box industry in Assam, R. S. PEARSON (*Indian Forest Rec.*, 5 (1913), No. 1, pp. III+33, pl. 1).—A descriptive account of the tea box industry in Assam, the successive chapters of which discuss the supply of timber and tea boxes in Assam, conversion of timber into tea shooks, advantages and disadvantages under which the local tea box trade is maintained, résumé of experiments in hand to reduce the liability of tea box timbers to deterioration and insect attacks, and proposals made with a view of fostering the local tea box industry.

Plant introduction and acclimatization, J. J. THORNBUR (*Arizona Sta. Rpt.* 1912, pp. 675-677).—Notes are given on the following ornamentals which are

being tested by the station: Native wild cotton (*Igenhauzia triloba*), *Lippia wrightii*, huisache (*Vachellia farnesiana*), sotol (*Dasyllirion wheeleri*), bear grass or hickory grass (*Nolina microcarpa*), *D. graminifolius*, native leadwort (*Plumbago scandens*), canyon goldenrod (*Solidago sparsiflora subcinerca*), native spiderwort (*Tradescantia scopulorum*), Spanish broom (*Cytisus scorparius*), and Russian oleaster (*Elæagnus hortensis songorica*).

New garden plants of the year 1912 (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1913, App. 3, pp. 50-78*).—This comprises a descriptive list of all the new plant introductions recorded during 1912 in various botanical and horticultural publications, both English and foreign.

Dahlias, G. GORDON (*London and Edinburgh [1913], pp. XI+115, pls. 8*).—A popular treatise on dahlia culture in which the various desirable forms are described and suggestions are given relative to selections for various color effects, as well as the production of an abundant supply of cut flowers and exhibition blooms.

Success in gardening, JESSIE P. FROTHINGHAM (*New York, 1913, pp. XIII+333, pls. 16*).—A popular treatise on ornamental gardening. The subject matter, which is arranged with reference to the work for each week in the year, is largely based on a garden day-book formerly kept by the author's father.

FORESTRY.

American forest trees, H. H. GIBSON, edited by H. MAXWELL (*Chicago, 1913, pp. 708+XV, pl. 1, figs. 227*).—This work comprises popular descriptions of the leading timber species of the United States and of a large number of less important trees. The subject matter has previously appeared for the most part in a series of articles in the *Hardwood Record* of Chicago.

The various trees are considered with reference to their distinguishing characteristics, prominent physical properties, and the adaptability of their wood for various uses. The descriptions are accompanied by photographs and drawings of trunk and foliage.

The forests of Prince George's County, F. W. BESLEY (*Baltimore, Md.: State Bd. Forestry, 1913, pp. 40, pls. 4*).—This report is based on a forest survey made in 1907 under the direction of the Maryland State Board of Forestry.

The subject matter is discussed under the following general headings: Topography and soil, the distribution of the forests, forest types, the stand of timber and its value, value of the present stand of timber, native tree species, the important commercial trees, the products of the forests, transportation facilities, destructive influences, and forest management. A forest map of the area is appended.

The trees and shrubs of Oklahoma, C. W. SHANNON (*Okla. Geol. Survey Circ. 4, 1913, pp. 41, fig. 1*).—A preliminary list of the trees and shrubs of Oklahoma, including the family, genus, and scientific and common names, together with notes on the general and specific occurrence of each plant.

Experiments on individual selection with forest trees.—I, *Pinus sylvestris*, E. ZEDERBAUER (*Centbl. Gcsam. Forstw., 38 (1912), No. 5, pp. 201-212, pl. 1, figs. 3*).—This comprises the results of an experimental study of the progeny of various individual Scotch pine trees growing in the same stand or locality. The study was continued for several years in a number of localities. The data are here presented in tabular form and fully discussed.

The author concludes that the variability of the individuals in a stand is not only dependent upon the locality but also upon inherited characteristics. In a Scotch pine stand may be seen broad open-crowned individuals with few but strong, quick growing branches and also small dense-crowned individuals with

many weak and slow growing branches. The former produce the greater amount of timber. The progeny of the broad-crowned seed trees are more vigorous than those of the small-crowned seed trees. In general the habits of the progeny more or less resemble those of the seed parent.

The progeny of very old seed trees are essentially smaller than those of very young seed trees. On the other hand, there appears to be no great variation among progeny from seed trees ranging in age from 15 to 100 years.

The progeny of different seed trees showed a varying degree of resistance against needle blight. In one stand the progeny from a dominant seed tree were apparently immune to blight, whereas the progeny of a suppressed seed tree in the same stand showed a strong disposition to blight. In one case practically all the offspring of the parent were attacked by blight, except a few individuals which appeared to be immune.

Experiments on individual selection with forest trees.—II, *Pinus austriaca*, E. ZEDERBAUER (*Centbl. Gesam. Forstw.*, 39 (1913), No. 5, pp. 197-204, figs. 3).—A study of inherited tendencies in the progeny of Austrian pine seed trees is here reported in detail. The author's conclusions are essentially the same as those reported in the above noted experiment with Scotch pine.

On the biology of Siberian pine (*Pinus sibirica*), R. POLE (*Izv. Imp. St. Peterb. Bot. Sada (Bul. Jard. Imp. Bot. St. Petersb.)*, 13 (1913), No. 1-2, pp. 1-22, pls. 3, figs. 3).—A study of the Siberian pine with reference to its distribution, habitat, reproduction, and economic importance.

The periodic phenomena of pine reproduction on the polar forest border. A. RENVALL (*Fennia: Bul. Soc. Geogr. Finlande*, 29 (1912), No. 4, pp. XII+154, pl. 1).—This embraces the results of a study by statistical methods of pine reproduction in the north polar region. Consideration is given to the phenomena of flower development, cone formation, and seed production. A bibliography of cited literature is appended.

The strength of long-seasoned Douglas fir and redwood, A. C. ALVAREZ (*Univ. Cal. Pubs., Engin.*, 1 (1913), No. 2, pp. 11-20, pls. 2).—This bulletin reports mechanical tests of Douglas fir and redwood timber which had been used as wall studding, floor joists, and underpinning in a building on the University of California campus for a period of 37 years.

Although the number of tests was not large enough to justify any sweeping conclusions, a comparison of averages from the results with those given by Cline and Heim (*E. S. R.*, 28, p. 50) on similar timber air-seasoned for 2 years shows that the long-seasoned timber possessed greater strength in longitudinal shear, as well as a higher modulus of elasticity and higher fiber stresses at the elastic limit and at the maximum load. The maximum crushing strength in compression longitudinally is 40 per cent higher for the long-seasoned Douglas fir, but its elastic limit is 30 per cent lower. The longitudinal crushing strength of the long-seasoned redwood is 25 per cent greater. The well-preserved condition of the floor joists shows that proper ventilation will prevent the decay of timber that is exposed to a damp atmosphere.

Further mechanical tests of a similar nature are to be made in the near future.

Volume table for redwood, compiled by A. W. ELAM (*Alameda, Cal.*, 1913, pp. 20).—This volume table is designed for scaling 16 ft. logs, 18 to 144 in. in diameter and with a taper of from 2 to 8 in.

The physiological atavism of our oaks and beeches, W. MAGNUS (*Biol. Centbl.*, 33 (1913), No. 6, pp. 309-337).—This comprises a review of our knowledge relative to growth periodicity among woody plants of various climates, with special reference to the tendency of oaks and beeches to retain the last years' foliage until growth starts in the spring. The author concludes that

the discontinued growth of the oak and beech in the temperate climate, as well as the retention of old leaves until the new leaves begin to form, must be regarded as periodic growth phenomena independent of the climate, just as the winter rest period of the oak and beech in Madeira is independent of climate. A bibliography of cited literature is appended.

Note on gumbâr (Gmelina arborea), A. RODGER ([*Indian*] *Forest Bul.* 16, 1913, pp. 10, pl. 1).—A note on the gumbâr tree of India with reference to its general distribution; locality and habit; description, properties, and uses of timber; minor products; natural reproduction; artificial reproduction; and distribution and exploitation in different Provinces. A small section of the wood accompanies the bulletin.

Note on bija sal or vengai (*Pterocarpus marsupium*), A. RODGER ([*Indian*] *Forest Bul.* 17, 1913, pp. 17, pl. 1).—A note similar to the above on the bija-sal or vengai tree.

Note on sain or saj (*Terminalia tomentosa*), A. RODGER ([*Indian*] *Forest Bul.* 18, 1913, pp. 26, pl. 1).—A note similar to the above on the sain or saj tree.

Note on benteak or nana wood (*Lagerstroemia lanceolata*), A. RODGER ([*Indian*] *Forest Bul.* 19, 1913, pp. 9, pl. 1).—A note similar to the above on the benteak or nana tree.

Note on sândan (*Ougeinia dalbergioides*), A. RODGER ([*Indian*] *Forest Bul.* 20, 1913, pp. 9, pl. 1).—A note similar to the above on the sândan tree.

Note on dhaura or bakli (*Anogeissus latifolia*), A. RODGER ([*Indian*] *Forest Bul.* 21, 1913, pp. 15, pl. 1).—A note similar to the above on the dhaura or bakli tree.

A note on the causes and effects of the drought of 1907 and 1908 on the sal forests of the United Provinces, R. S. TROUP ([*Indian*] *Forest Bul.* 22, 1913, pp. 17, pls. 3).—This embraces the results of an investigation of drought injury in the sal forests of the United Provinces.

A note on the blue gum (*Eucalyptus globulus*) plantations of the Nilgiris, R. S. TROUP (*Indian Forest Rec.*, 5 (1913), No. 2, pp. 11+40, pls. 10).—This embraces the results of a survey of the Nilgiri eucalyptus plantations. The subject matter is discussed under the following general headings: General description of locality and plantations, the silviculture and management of the blue gum in the Nilgiris, and statistical information. Summaries of results of measurements in coppice crops and in high forest crops, together with a note on eucalyptus species in Nilgiris, by R. Bourne, are appended.

A fence post test, F. G. KRAUSS (*Hawaii. Forester and Agr.*, 10 (1913), No. 5, pp. 113, 114).—This comprises a brief statement of a test of eucalyptus fence posts, conducted on the farm of the College of Hawaii during the past 2 or 3 years.

An examination of the posts in the spring of 1913 showed that creosoted posts were in the best state of preservation. Tarred posts were giving the next best results; charred posts showed about the same amount of decay as the untreated posts; and posts set in concrete showed somewhat more decay than the untreated posts.

Further examinations of these posts will be made from time to time.

Work with guayule, J. J. THORNER (*Arizona Sta. Rpt.* 1912, pp. 673, 674).—Experiments conducted by the station with guayule (*Parthenium argentatum*), indicate that this rubber plant can be grown successfully under favorable cultural conditions. Thus far, however, the plants have not been tried out under the average mesa and foothill conditions. Plants were successfully started under favorable mesa conditions and with irrigation during the hot, dry foresummer, but were later so seriously eaten back by jack rabbits as to be destroyed.

The aging and conservation of wood.—Insulated wood, M. DE KEGHEL (*Rev. Gén. Chim.*, 15 (1912), Nos. 2, pp. 37, 38; 5, pp. 85-93).—This is a discussion of methods of artificially aging wood, of making insulated wood, and of conserving wood with preservatives.

National Forest timber for the small operator, W. B. GREELEY (*U. S. Dept. Agr. Yearbook 1912*, pp. 405-416, pls. 3).—A popular discussion of the sales policy of the Department on the National Forests with special reference to opportunities afforded to small logging operators, as well as to farmers and settlers in the vicinity of the forests.

Seed collection on a large scale, H. H. FARQUHAR (*U. S. Dept. Agr. Yearbook 1912*, pp. 433-442, pls. 4).—A detailed account is given of the methods employed in collecting large supplies of pine seed on the National Forests.

Experiments on the influence of fertilizers in the nursery, E. CUIF (*Ann. Sci. Agron.*, 4. ser., 2 (1913), I, No. 6, pp. 433-454).—This is a descriptive account of fertilizer experiments in forest nurseries which have been conducted under the direction of the Nancy experiment station since 1906.

Forest statistics (*Statist. Jahrb. K. K. Ackerb. Min.* [Vienna], 1910, pp. VI+441).—A statistical account of the forests and forest enterprises in Austria for the year 1910, including also game statistics.

Annual progress report of forest administration in the Western and Eastern Circles of the United Provinces for the forest year 1911-12, B. B. OSMASTON, J. S. CAMPBELL, and P. H. CLUTTERBUCK (*Ann. Rpt. Forest Admin. West. and East. Circles [India]*, 1911-12, pp. 20+11+18+CIII+5).—The customary statistical review of the constitution and management of the state forests in the Western and Eastern Circles of the United Provinces, including a financial statement for the forest year 1911-12. Data relative to areas, forest surveys, working plans, etc., yields in major and minor forest products, revenues, and expenditures are appended in tabular form.

Administration report of the forest circles in the Bombay Presidency, including Sind, for the year 1911-12 (*Admin. Rpt. Forest Circles Bombay, 1911-12*, pp. 177+5).—A report similar to the above on the administration of the state forest in the Bombay Presidency and Sind.

Report on forest administration in Burma for the year 1911-12, T. A. HAUXWELL, W. F. L. TOTTENHAM, C. G. ROGERS, and G. R. LONG (*Rpts. Forest Admin. Burma. 1911-12*, pp. 3+XIV+179).—A report similar to the above on the administration of the state forests in Burma for the year 1911-12.

DISEASES OF PLANTS.

Studies on the Fusarium problem, H. W. WOLLENWEBER (*Phytopathology*, 3 (1913), No. 1, pp. 24-50, pl. 1, fig. 1).—Attention is called to the unreliability of the stroma as a taxonomic character in determining species of Fusarium, and a method is described for the differentiation of the species.

The author has divided the genus into six sections based on physiological as well as morphological characters. As a result of his studies he has concluded that *Neocosmospora*, to which has been attributed the wilt of cowpeas, etc. (E. S. R., 11, p. 944), is an obligate saprophyte and is not genetically connected with the genus Fusarium. *F. oxysporum* and *Verticillium albo-atrum* are thought to have no connection with the leaf roll disease of Germany, but to cause stem wilts with symptoms identical with the Kräuselkrankheit as described by Reinke and Berthold. Root rots of potatoes are caused by *F. caeruleum*, *F. discolor sulphureum*, *F. trichothecioides*, and *F. ventricosum*. The tuber ring discoloration is said to be a secondary symptom of stem ring wilt disease. The con-

ditions favoring rapid infection are a temperature of from 14 to 26° C., the presence of 75 per cent or more of humidity, and little ventilation.

A bibliography is appended.

On the systematic position of *Fusarium nivale* as regards its higher fruit form, E. SCHAFFNIT (*Mycol. Centbl.*, 2 (1913), No. 5, pp. 253-258, figs. 2).—The author reports a further study (E. S. R., 29, p. 47) of *F. nivale*, the higher fruit form of which, otherwise called *Nectria graminicola*, is described under the name *Calonectria nivalis* n. sp. It is said to present great multi-formity as to devices for propagation, showing ascospores, conidia, chlamydospores, and sclerotia.

Concerning the sclerotia of *Monilia*, E. VOGES (*Ztschr. Pflanzenkrankh.*, 23 (1913), No. 3, pp. 137-140).—To a previous communication (E. S. R., 26, p. 849), the author adds that further study of certain sclerotia, found in association with those of *M. fructigena* and assumed to belong thereto, has shown that such sclerotia are sterile and in other ways different in behavior from those of *M. fructigena*.

Recent literature on fungus diseases of plants, L. H. PAMMEL (*Trans. Iowa Hort. Soc.*, 47 (1912), pp. 214-223).—Summaries are given of numerous recent papers on plant diseases, mainly from American and Canadian sources.

Diseases of plants in Iowa for 1912, L. H. PAMMEL (*Trans. Iowa Hort. Soc.*, 47 (1912), pp. 196-213, figs. 14).—The author states that during 1912 cultivated plants were fairly free from fungus diseases. This is attributed to favorable weather conditions, which are given in some detail for Ames, Iowa. The most notable feature of the year is said to have been the spread and injury to apple trees by the Illinois canker, apple blotch, and powdery mildew on the seedlings.

Report of the imperial mycologist, E. J. BUTLER (*Rpt. Agr. Research Inst. and Col. Pusa [India]*, 1911-12, pp. 54-64).—Besides accounts of other work of the institute, reports are made of plant investigations completed in 1911 and 1912, or now in progress or in contemplation.

The ufra rice disease of eastern Bengal is said to have increased in violence, and it is claimed that recent investigations point to a nematode, *Tylenchus* sp., as the probable cause of the trouble. An unsuccessful attempt to trace by field inoculations the life history of the "false" smut of rice due to *Ustilago virens* is being repeated.

Rhizoctonia solani is reported as a root rot on potatoes at Bankapur; on jute, peanut, and cowpea at Pusa; on sesame at Surat; and on seedling cotton at Cawnpore, this last attack being claimed to be identical with sore shin in Egypt and damping off in America. *R. solani* is suspected to form biologic races corresponding with its various hosts. A second *Rhizoctonia*, found on peanut and cowpea, was examined, the study resulting in the retention thereof of the name *R. violacea*. In the difficult work of combating *Rhizoctonia*, a dressing of naphthalin was found beneficial in case of cotton. Carbolic acid proved helpful but expensive. Cereals appear to be immune to *Rhizoctonia* and their employment in rotation is suggested.

For the first time in some years a severe attack of wheat rust is reported in the Central Provinces and elsewhere, notably in Rajputana. Most of the damage was caused by orange rust (*Puccinia triticea*) and black rust (*P. graminis*), yellow rust (*P. glumarum*) being much less common. Orange rust has recently much extended its territory.

Phytophthora colocasiae, which attacks kachu (*Colocasia antiquorum*), was studied and is to be reported on later. The saprophytic culture of another species of *Phytophthora* which attacks the castor bean plant was accomplished. *P. infestans* was found attacking potatoes and tomatoes at Jorhat

in Assam, causing the fear that this fungus is developing a race which will be able to withstand the heat of the plains.

Information was obtained regarding the methods of infection of sugar cane other than by planting diseased cuttings, both in red rot and *Cephalosporium* disease, also as regards smut. A disease of sugar cane closely resembling the sereh disease, which causes so much loss in Java, was reported from eastern Bengal and Assam.

The plague of betel nut palms in Bengal and Assam, which has continued to spread north and east, causing immense losses, was studied, and its cause is thought to be *Polyporus (Fomes) lucidus*. Lime is said to have a beneficial effect.

An *Exobasidium* closely related to that causing blister blight of tea was discovered on *Camellia drupifera*, but did not prove identical with blister blight, which was severe in parts of Assam. The tea seed bug (*Pæcilocoris latus*) was further investigated as to its suspected rôle in the fungus infection of tea seed.

A new investigation of wilt of Java indigo was entered upon. Cotton wilt of Lilapur was thought to result from an impermeable stratum some distance below the surface of the soil. Buri cotton appeared to be immune to the wilt.

Studies were reported on various other diseases of cultivated plants and of forest trees. About 200 additions were made to the parasitic flora of India, including a number new to science. A list of publications issued by the institute is appended.

Parasitic injury to winter grains, K. STÖRMER and R. KLEINE (*Deut. Landw. Presse*, 40 (1913), No. 31, pp. 377, 378).—The authors, besides giving a discussion of some insect injuries, describe a simple method for testing the degrees of germinability and safety of seed grain of winter wheat and rye. This consists in placing samples 4 cm. deep in moist quartz sand for 10 days and noting the percentage of sprouted grains and also of grains discolored by the fungus. The test need be applied only after such years as 1912, characterized by damp or wet weather during the ripening and harvesting period, as such dry years as 1911 show practically none of the infection, which is said to be due to a *Fusarium*. A treatment for the seed, to be applied when found necessary, consists in stirring the grain thoroughly in a 0.001 per cent solution of corrosive sublimate and covering with wet sacks over night to allow inhibition of the solution, after which it should be planted immediately.

Abnormal barley ears, E. MOLZ (*Deut. Landw. Presse*, 40 (1913), No. 33, p. 406, figs. 3).—The author describes a case observed in which ears of barley showed loose structure with frizzled and crumpled beards, supposed to result from abnormally rapid growth of the stalk due to wet weather following dry weather and resulting poor development of the leaf sheath. A similar appearance was noted in case of barley the leaf sheaths of which had been injured in the same stage by hail. Cases somewhat similar are cited in which insect or fungus attack was followed by a like abnormality.

Injuries noted to clover and rye, L. HILTNER (*Prakt. Bl. Pflanzenbau u. Schutz*, n. ser., 11 (1913), No. 4, pp. 54-56).—The author states that in several parts of Bavaria crops from clover seed obtained from Italy and southern France were more severely attacked by clover canker (*Sclerotinia trifoliorum*) and by nematodes than were those from seed grown in the more northerly parts of Europe. This is ascribed to their habit of continuing growth until later in the fall, and thus entering the winter poorly provided for as regards reserve and protective substances. Wet weather, causing luxuriant growth during the previous autumn, with late cutting favors development of fungi and also weakens the plants. Of three fields alike in all respects except that two

had four years previously borne a crop of white clover while the other bore red clover, the former showed good stands in the spring while in the latter the clover had practically all died out. It is stated that after vigorous growth begins in the spring the danger of spread and further injury by canker is probably small, and it is thought advisable to plant Italian rye grass in the killed areas. A top-dressing of potash, phosphoric acid, and liquid manures is also recommended.

In spite of the mild winter, it is said that sufficient snow lay on the ground to produce a considerable *Fusarium* attack on rye. Treatment of the seed with corrosive sublimate is favored.

Appearance of clover canker, K. STÖRMER (*Deut. Landw. Presse*, 40 (1913), No. 29, pp. 350, 351).—The author discusses a severe outbreak of clover canker in several parts of the Province of Pomerania, due to *Sclerotinia trifoliorum*. The fungus is said to present a certain similarity to that seen in ergot of rye. No reliable means of control is yet offered. The use of chemical fertilizers, foreign species of clover, or alternation with Italian rye grass, etc., is recommended.

The rice crop failure in the residency of Madion in 1910, P. VAN DER ELST (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Rijst.*, 1912, pp. IV+104, pl. 1, figs. 2).—This is a study of the rice disease long known on certain flat lands of Madion, locally called omo mentek and thought to be identical with that called brusone in Italy, imoci in Japan, ufra in India, and rust in the United States.

The disease is said to begin with the death of the root hairs and to proceed upward, killing and rotting the rootlets to levels near the surface of the ground. It is associated with continued flooding or protracted rains (as during the east monsoon); with poor drainage and aeration; with oxygen starvation of the roots, due to the presence of reducing substances and a compact structure of the soil; with the presence of weeds; and with the previous planting of sugar cane on the same soil, resulting in lack of nitrogen or phosphoric acid, or both. The author suggests rice root rot as the most appropriate and descriptive name for the disease.

Preventive or remedial measures recommended include the improvement of the soil structure by addition of organic manures, by drainage, and if necessary by turning it temporarily to meadow; the better regulation of the rotation where sugar cane is involved; a more careful selection of seed; the early drainage and ventilation of the soil after the setting in of the east monsoon; the proper timing of the planting with regard to monsoon changes; dry seed beds; cultivation of the ground before the setting in of the west monsoon; planting in drills; regulation of water supply during cultivation; adaptation of artificial manures; proper control of weeds; and alternate cultivation of the soil with ample irrigation, avoiding stagnation of the water.

Septoria pisi in relation to pea blight, P. E. MELHUS (*Phytopathology*, 3 (1913), No. 1, pp. 51–58, pl. 1).—An investigation was begun in 1911 of *S. pisi* in relation to pea blight. A number of authors have reported *Ascochyta pisi* as causing injury to peas, but the author's observations indicated that this fungus was not present in any quantity and that *S. pisi* was associated with the disease in great abundance. Infection experiments were carried on which showed that most of the trouble was due to *S. pisi*.

While carrying on these studies the possibility of the connection of *Mycosphaerella pinodes* with *S. pisi* was considered. It seems that *Mycosphaerella* is associated with *Ascochyta* rather than *Septoria*. There is believed to be evidence indicating a perfect stage of the fungus *S. pisi*, but as yet it has not been discovered.

Studies on bacterial disease of peanut, A. W. K. DE JONG (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Agr. Chem. Lab., 1913, No. 3, pp. 56-59*).—These experiments were carried on in 1912-13.

Sulphur added to the soil showed little or no practical benefit. Attempts to breed a more resistant variety gave a measure of success, but seeds from the few plants which had recovered from the disease appeared to have been weakened as they yielded readily to attack. Keeping water standing around the plants from 1 to 4 weeks showed no good effect as prevention against bacterial disease.

On the nomenclature of the organism causing corky or powdery scab in the potato tuber, *Spongospora subterranea*, G. H. PETHYBRIDGE (*Jour. Roy. Hort. Soc. [London], 38 (1913), No. 3, pp. 524-530*).—A discussion is given of the nomenclature of the fungus causing the powdery scab of potatoes. The author claims that under International Rules the name should be *S. subterranea*.

Powdery scab of potatoes, *Spongospora subterranea*, H. T. GÜSSOW (*Phytopathology, 3 (1913), No. 1, pp. 18, 19, pl. 1, fig. 1*).—The author reports having received from various localities in Canada samples of potatoes affected with powdery or corky scab (*S. subterranea*). Subsequent investigations have shown that this disease is present in some of the counties of Quebec as well as in isolated localities in Cape Breton, Nova Scotia, New Brunswick, Ontario, and Alberta.

Powdery scab of potatoes in the United States, W. J. MORSE (*Science, n. ser., 38 (1913), No. 967, pp. 61, 62*).—Attention is called to the occurrence of the powdery scab of potatoes, due to *Spongospora subterranea*, reported in Canada by Güssow (see above). In connection with studies on potato scab, the author obtained material from a number of localities, and upon thorough examination the spore balls of *S. subterranea* were found in the material received from Massachusetts and Nebraska. While there is no conclusive evidence that the powdery scab exists in other parts of the United States, the fact that it was obtained from two widely separated localities indicates that it may be quite generally distributed and possibly a factor in the cause of potato scab in this country.

Wart disease of potatoes, G. T. MALTHOUSE (*Field Expts. Harper-Adams Agr. Col., and Staffordshire and Shropshire, Rpt. 1912, pp. 26-29, pls. 2*).—Continuing work with potatoes previously noted (*E. S. R., 24, p. 648*), the author gives, along with statements as to quality, some numerical and graphical comparisons as to yield and as to resistance toward disease.

Of the early varieties none are recommended, and but two of the second early. A considerable number of main crop varieties were found to be resistant, but only a few were found to be suitable to general planting. Great Scot is said to be the best of the varieties grown. Only a few continental varieties proved to be resistant. Instances of possible sporting were noted, only a few plants per row of some kinds showing susceptibility to wart disease. Seed from these are to be further tested. The numerous fungicides tested either failed to arrest the development of the fungus or destroyed the potato crop in every case. The cultivation of tubers from seedlings was carried forward (a number of these being planted out), as was also the experimentation in hybridization. In case of varieties planted in duplicate at the college grounds and at Stanton, it was often found that a kind sterile at one place produced abundant pollen at the other, or vice versa. Tests with several annual exotic *Solanums* resulted in no infection by wart disease on any other species of the genus.

To test the possibilities of cultivation, on one plat the potatoes were planted in the usual way in the top layer of soil. On a second this top layer was

removed and the seed planted in the second layer prepared as usual. On a third the soil was completely turned upside down three layers deep and the potatoes planted as usual. The total yields in the three cases were, respectively, 65, 205, and 255 lbs. per square rod, with an infection rate, respectively, of 53, 41, and 19.5 per cent of the tubers produced.

Report on the prevalence of wart disease in Shropshire, 1912, J. W. RYLAND (Field Expts. Harper-Adams Agr. Col., and Staffordshire and Shropshire, Rpt. 1912, pp. 39, 31).—The author reports the results of inspection of about 1,000 gardens and fields of potatoes. The disease was discovered in 535 places. In a number of cases the seed had been purchased from peddlers or at auction or from other unreliable sources. It was shown in some instances that the spores had lain in the ground quiescent while nonsusceptible crops were grown during 4 to 8 years, the seed and manure being above suspicion, but that on again planting these plats in potatoes from $\frac{2}{3}$ to $\frac{3}{4}$ of the crop was affected with wart disease.

Some successful inoculations with the peach crown gall organism and certain observations upon retarded gall formation, C. O. SMITH (*Phytopathology*, 3 (1913), No. 1, pp. 59, 60).—The author reports successful inoculations with the crown gall organism (*Bacterium tumefaciens*) from peaches on pepper trees, Japanese persimmons, various walnuts, pecans, the forest red gum, a large number of varieties of quince, almond, apricot, cherry, peach, and plum, oranges, lemons, sweet limes, fig, the Victoria bottle tree, and the flame tree.

Attention is called to two instances of retarded gall formation, in the Angiers quince and the fig.

The migration of *Bacillus amylovorus* in the host tissues, FRED A. BACHMANN (*Phytopathology*, 3 (1913), No. 1, pp. 3-14, pls. 2, figs. 2).—An examination has been made into the histological relations of host and parasite in connection with *B. amylovorus*. Inoculations were made of pear blossoms, water shoots of apple, young pear seedlings, young shoots of pear and plum, and fruits of the apple and pear.

In the shoots of the different hosts the first indication of disease is shown by the plasmolysis of the cells of the cortex and to some extent those of the pith. In the early stages of infection in apple shoots the intercellular spaces were found crowded with bacteria, while the cells were only partially plasmolyzed. Later the walls of the cells of cortex and pith become broken down and bacteria may enter the cells. The bacteria were found to enter the xylem tubes very readily, and it is thought that in tender tissues of young seedlings the organisms may penetrate the xylem tubes at any place. The parenchyma cells between the xylem tubes are densely filled with granular cytoplasm and are usually entirely free from bacteria. It is thought that probably the bacteria destroy or break through the thinner walls of the tracheids, and that the thin-walled cells of the xylem become plasmolyzed and partially disintegrated, resulting in large open spaces being formed in the xylem.

In the fruit the author found that the path of migration was through the intercellular spaces from the region of inoculation to all parts of the fruit. The bacteria were found to extract the cell sap from the cells causing their death. It is believed that if toxic substances are produced they do not precede the advance of the bacteria, since bacteria are found between apparently normal cells. There was no evidence that the bacteria progressed from cell to cell.

Combating *Peronospora* on the basis of recent investigations, R. GEENECK (*Weinbau u. Weinhandel*, 30 (1912), No. 47, p. 498).—In 1912 experiments were carried out utilizing the results of studies on *Peronospora* of grape obtained by H. Müller-Thurgau (*E. S. R.*, 28, p. 244). Of the four plats studied, one was not

sprayed, a second was sprayed on the upper leaf surface only, a third on the lower surface only, and a fourth on both sides. Bordeaux mixture was employed in 1 per cent strength May 28 and 2 per cent June 12 and July 2.

All vines remained clear of the infection to the middle of June when weather increasingly favorable to *Peronospora* set in. Under the influence of this weather lot 1 became so badly infected by June 21 that the stocks had to be very thoroughly sprayed to prevent loss of all the leaves. These during the rest of the experiment exhibited the ill results of late spraying in case of such weather, 95 per cent of the leaves being attacked and showing an average per leaf of from 10 to 12 points of infection. Early in July plats 2 and 3 also showed attack, the former on from 60 to 65 per cent of the leaves, the latter on about 50 per cent, the latter high percentage being attributed to the increased difficulty of the late spraying from the under side when the leaves were thick and large. Plat 4 was not attacked, which fact is taken to indicate the advantage of complete treatment in weather so favorable to *Peronospora*. It is thought, however, that this may be economically attained and at the same time the flowers and grapes may be better reached by employing a fine spray under high pressure directed obliquely upward. It is considered that these experiments confirm the views of Müller-Thurgau and that they demonstrate the necessity of early and timely spraying, repeated whenever rain falls soon after its employment, but that weaker solution than commonly used may be safely employed.

A rot of grapes caused by *Cryptosporella viticola*, C. T. GREGORY (*Phytopathology*, 3 (1913), No. 1, pp. 20-23, figs. 2).—While studying the black rot of Niagara grapes in September, 1911, the author observed many berries that did not exhibit the typical black rot effect. Studies were made of these, and as a result of inoculation experiments it was found that the berries were attacked by *C. viticola*, the same fungus which causes the dead-arm disease of the grapevine and which upon the fruit produces a rot quite similar to the common black rot.

A new *Exobasidium* disease of the tea plant, S. ITO and K. SAWADA (*Bot. Mag. [Tokyo]*, 26 (1912), No. 308, pp. 237-241, figs. 7; *abs. in Mycol Centbl.*, 2 (1913), No. 5, p. 274).—The authors report a disease of *Thea sinensis*, said to be very serious in the province of Suruga and to be common in the north of Formosa. It attacks the young tea leaves and it is said to be different from *E. vexans*, being described under the proposed name *E. reticulatum* n. sp.

Diseases of the sweet pea, J. J. TAUBENHAUS and T. F. MANNS (*Gard. Chron.*, 3. ser., 54 (1913), No. 1385, pp. 21-25, figs. 12).—The authors describe certain diseases of the sweet pea, the investigations of which have been carried on for some time.

Among those described are the mosaic disease, the exact cause of which is not definitely known. This disease can be artificially induced, and it is thought that under field conditions green aphids are the active agents in its distribution. The disease is considered contagious, but all attempts to discover the organism have as yet failed.

A description is given of the root rot caused by *Thielavia*, root rot caused by *Rhizoctonia* or *Corticium*, stem or collar rot due to *Sclerotinia libertiana*, *Fusarium* wilt, nematode attacks, anthracnose caused by *Glomerella rufomaculans*, bud drop, or failure to set blossoms, which is attributed to too high fertilization with nitrogenous fertilizers, and powdery mildew, which in England is attributed to *Erysiphe polygoni* and which in the United States has not been definitely determined.

Notes on some western Uredineæ which attack forest trees, II, G. G. HEDGCOCK (*Phytopathology*, 3 (1913), No. 1, pp. 15-17).—In continuation of a previous note (*E. S. R.*, 27, p. 252), the author gives an account of some ob-

servations on *Peridermium filamentosum*, *P. harknessii*, *P. montanum*, *P. coloradense*, and *Melampsorella clatina* occurring on coniferous and other trees in some of the western National Forests.

The chestnut bark disease, H. METCALF (*U. S. Dept. Agr. Yearbook 1912*, pp. 363-372, pls. 4).—A popular description is given of the chestnut bark disease, due to *Endothia parasitica*. This disease is said to be distributed from Merrimack County, New Hampshire, and Warren County, New York, to Albemarle County, Virginia, and westward to Livingston County, New York, Warren and Somerset counties, Pennsylvania, and Randolph County, West Virginia. These latter locations of infection are said to owe their origin to diseased chestnut nursery stock. The different lines of investigation and control that are being carried on are described and advice given for the individual treatment of diseased trees, to chestnut orchardists, and to owners of ornamental chestnut trees and of chestnut woodland.

The spotting of plantation *Para ruber*, K. BANCROFT (*Dept. Agr. Fed. Malay States Bul. 16*, pp. 30, pls. 3).—The author discusses the appearance, symptoms, causation, and treatment of discoloration of plantation rubber in Ceylon and the Malay States, giving a description thereof and an account of the changes produced thereby.

Investigations showed the presence and possible causative action of *Bacillus prodigiosus* and of four fungi, *Monascus heterosporus*, *Thyridaria tarda*, *Mycogone* sp., and *Spondylocadium maculans* n. sp., in the spotted rubber. The germination and growth of three of these in latex have been demonstrated. One was employed to reproduce the coloring in prepared rubber artificially and again isolated. Clear patches of unsmoked sheet showed mycelium and spores of several kinds, usually species of *Penicillium* and *Aspergillus*. Other organisms, one a red yeast, were obtained from the red spots. Three of the above fungi were isolated from the racks upon which the rubber was hung, also from jungle poles, and spores were readily obtained from the air. Oil, dirt, and chemical changes also caused discolorations.

Smoking, drying at high temperatures, and isolation are mentioned as protective measures. Most of the ordinary chemical treatments are barred because of injurious effects on the rubber. Drying and thorough washing are said to remove the milder degrees of spotting.

A new wood-destroying fungus, ADELINE AMES (*Bot. Gaz.*, 55 (1913), No. 5, pp. 397-399, figs. 6).—A description is given of a polyporous fungus received at the Cornell University laboratory from Alabama where it was reported as growing upon a stairway and floor situated near water pipes. The wood on which the fungus was growing consisted of bald cypress and long leaf pine, and in advanced stages of decay it was of a dark brown color, checked into small cubes.

A study of the fungus seemed to indicate that it was an undescribed species, and it is provisionally placed in the genus *Poria*. The name given it is *P. atrosporia* n. sp., a technical description of which is given.

Notes on the wetting power of fungicides, V. VERMOREL and E. DANTONY (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 19, pp. 1475, 1476; *Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 21, pp. 657, 658).—As a result of their investigations, the authors recommend the use of gelatin with copper fungicides which are acid in reaction and casein with those which are alkaline. These substances may be added in quantities varying from 20 to 50 gm. per hectoliter of fungicide.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Our meadow larks in relation to agriculture (*Sturnella magna* and *S. neglecta*), F. E. L. BEAL (*U. S. Dept. Agr. Yearbook 1912*, pp. 279-284).—Attention is first called to the fact that 2 species of meadow larks inhabit North America, the first (*S. magna*) with its several subspecies occupying the eastern part of the country; the second (*S. neglecta*) inhabiting the Pacific coast region and extending eastward to meet, and in some places overlap, the range of the first. In the matter of food, however, the species are scarcely distinguishable and may be considered from an economic standpoint as one.

Laboratory investigations of the contents of the stomachs of 1,514 meadow larks, collected in 36 States, the District of Columbia, and Canada, and in every month of the year, showed 74.22 per cent to consist of animal matter; more than five-sixths of which consisted of beetles, caterpillars, and grasshoppers. "Of the animal food 25.46 per cent is composed of the remains of beetles, and of these 12.10 per cent are useful species, mostly Carabidæ or ground beetles. Weevils, or snout beetles, amount to 4.94 per cent, and all others to 8.44 per cent." Diptera aggregate for the year 0.36 per cent; Lepidoptera in the shape of caterpillars hold a prominent position in the food from February to June, inclusive, attaining their maximum of 24.49 per cent in May, and for the year averaging 10.54 per cent. Orthoptera were eaten in every month and appear to be the favorite food of meadow larks; the average for the year is 26.08 per cent, and for each of the 3 months of August, September, and October they constitute more than one-half of the total diet. Spiders, myriapods, snails, and an occasional lizard make up the remainder of the animal food, or 4.31 per cent.

In the matter of vegetable food no such special preference is shown, though corn and weed seeds are evidently favored. Corn is taken only in the late fall and winter months and is probably mostly waste grain. "In estimating the economic value of the meadow lark it is significant that the total of grain in the meadow lark's diet is only 12.72 per cent of the whole, while noxious insects and weed seeds amount to 64.06 per cent."

Relation of birds to grain aphids, W. L. McATEE (*U. S. Dept. Agr. Yearbook 1912*, pp. 397-404, figs. 3).—This paper is based upon an investigation conducted from March 29 to April 4, largely on a badly infested farm near Winston-Salem, N. C. Three species of aphids were present, namely, the English grain aphid (*Macrosiphum granaria*), the spring grain aphid or so-called green bug (*Toxoptera graminum*), and the European grain aphid (*Siphocoryne avenæ*), the first mentioned being the most abundant.

Nine species of birds observed were found to have fed upon these plant lice. Aphids were found in all but 5 stomachs of the goldfinch (*Astragalinus tristis*) out of a total of 25 collected, no fewer than 325 plant lice having been counted in the contents of one stomach. Aphids constituted, on the average, 82.75 per cent of the total food, the average number of countable aphids in the 20 stomachs being 132.5. A single pine siskin (*Spinus pinus*) collected had eaten more than 80 aphids, which composed practically the entire stomach contents. Fifteen of 22 vesper sparrows (*Poæcetes gramineus*) collected were found to have eaten plant lice. The average percentage of the food composed of aphids was 19.5 and the largest number counted in any stomach was 42. Aphids composed an average of 25.3 per cent of the stomach contents of the 20 savanna sparrows (*Passerculus sandwichensis savanna*) collected. The largest number secured by any one bird was 130 and the average number 63.5. Thirty-five of 48 chipping sparrows (*Spizella passerina*) collected had eaten plant lice, one having eaten as many as 260, and the average number being 94.76. Three of 6 field sparrows (*S. pusilla*) had eaten plant lice to the aver-

age extent of 96 per cent of their food, or an average of 154 plant lice. Seven of 17 snowbirds (*Junco hyemalis*) had fed upon plant lice, 5.2 per cent of their food being composed of aphids. One of the 2 song sparrows (*Melospiza melodia*) collected had eaten about 50 plant lice, which composed 80 per cent of its food. A single titlark (*Anthus rubescens*) collected had eaten 100 or more aphids, which composed about 70 per cent of its food.

A fairly accurate census of the bird population on the farm on which the investigations were made, including, however, only those birds spending most of the time among the aphid-infested grain, gave the following results: Goldfinch, 300 individuals; vesper sparrow, 2,590; savanna sparrow, 70; chipping sparrow, 245; field sparrow, 20; snowbird, 70; and song sparrow, 6.

Entomology, A. W. MORRILL (*Arizona Sta. Rpt. 1912, pp. 692-695*).—A brief report of the occurrence during the year and work with insect pests, including the citrus thrips, the harvester ant (*Pogonomyrmex barbata*), the woolly apple aphid, the codling moth, the corrupted lady beetle (*Epilachna corrupta*), the green June bug (*Allorhina mutabilis*), and the squash capsid (*Pycnoderes quadrimaculatus*). See also a previous note (E. S. R., 28, p. 853).

[Notes on Philippine insects], C. R. JONES (*Philippine Agr. Rev. [English Ed.], 6 (1913), No. 3, pp. 141-143*).—Mention is made of infestation of the mango by the mango fruit fly (*Dacus ferrugineus*); of injury to the tomato plant by the leaf-eating coccinellid *Epilachna vigintioctopunctata*; of injury to corn by the maize stalk borer (*Pyrausta vastatrix*); and of the locust situation in the Visayas.

Insects injurious to the onion crop, F. H. CHITTENDEN (*U. S. Dept. Agr. Yearbook 1912, pp. 319-334, pls. 9, figs. 10*).—Of the insect enemies of the onion, the onion thrips (*Thrips tabaci*) is the most important. It causes injury to the onion crop practically throughout the country, producing a condition somewhat generally known as "white blast," "white blight," and "silver top." It is also the cause of "scullions," or "thick neck," terms used for the undeveloped and unmarketable bulbs. This thrips is now found in practically all cultivated fields in the United States, as well as in many uncultivated areas, so that there is always danger of infestation to onions and other susceptible crops, whether grown in new or in old land. Observations tend to demonstrate that in some localities at least it makes little difference as to the previous crop.

The life cycle has been found to require under the most favorable conditions about 3 weeks. Thus a dozen or more generations might be produced during a season. "Besides onions and related plants, this thrips attacks cabbage, cauliflower, parsley, cucumber, melon, pumpkin, squash, kale, turnip, tomato, seed beets, blackberry, and strawberry. Of ornamental plants it does much injury to carnations and roses and more or less injury to aster, blanket flower (*Gaillardia*), honeysuckle (*Lonicera*), daisies, nasturtium, narcissus, mignonette, candytuft (*Iberis*), four-o'clock (*Mirabilis*), and cone-flower or golden glow (*Rudbeckia*). Very serious injury is frequently committed to cucumbers and carnations in greenhouses, the damage sometimes amounting to the destruction of entire plantings."

Kerosene emulsion, whale-oil or fish oil soaps, and tobacco or nicotin extracts are recommended for use, their application being commenced early in the season. The importance of clean methods of field management, including the destruction by burning of culls, tops, and injured plants after the crop is gathered, is emphasized. Investigations in Texas and Indiana have shown the following formulas to give the most successful results: (1) Nicotin sulphate 3.2 oz., cresol soap 3 pints, and water 50 gal.; (2) nicotin sulphate 4.3 oz., whale-oil soap 4 lbs., and water 50 gal. "When spraying is once begun it should be continued at intervals of from 7 to 10 days, in case there is no heavy rainfall

during this period, and no surrounding breeding host for the species. The spraying should, as a rule, be continued up to 3 or 4 weeks of harvest time. In spraying for thrips the nozzles should be held well down upon the plants and the spray applied with as much force as possible."

Where sets are used considerable injury may be prevented by dipping them about a week before planting in nicotin sulphate at about the same strength as used for spraying and then giving 2 dippings in the same insecticide at planting time, or in almost any other of the solutions mentioned, including kerosene emulsion. Since this thrips displays preference toward cabbage and cauliflower, neither of these two crops should be grown contiguous to onions.

Brief accounts are given of several species of root maggots, including the seed-corn maggot (*Pegomya fusciceps*); the imported onion maggot (*P. cepe-torum*); the black onion fly (*Tritoxa flexa*); the barred-winged onion fly (*Chatopsis aenea*); and of remedial measures therefor. While the imported onion maggot is very destructive to nearly all forms of the onion family, there are quite as many, if not more, records of the seed-corn maggot doing the more abundant injury to onions, as well as to root crops in general and to many seeds. The seed-corn maggot, which first came into prominence in about 1902 although known here for many years before, is said to be greatly on the increase. Cutworms and wireworms are also briefly discussed.

Some important insect enemies of live stock in the United States, F. C. BISHOPP (*U. S. Dept. Agr. Yearbook 1912*, pp. 383-396, pls. 2, figs. 4).—This brief popular account deals with the buffalo gnat (*Simulium pecuarum*), the turkey gnat (*S. meridionale*), horseflies, gadflies, earflies, botflies, the horn fly (*Lyperosia irritans*), the stable fly (*Stomoxys calcitrans*), the screw worm (*Chrysomya macellaria*), the bedbug (*Cimex lectularius*), Mexican chicken bug (*Hæmatosiphon inodora*), sucking lice, and biting lice.

A new fruit and truck crop pest (*Irbisia brachycerus*), E. J. VOSLER (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 6, pp. 551-553, figs. 3).—A capsid, recently redescribed as *Capsus solani*, has been seriously damaging peaches in Solano County, Cal., by puncturing the skin and causing the sap to ooze out, and has also attacked radishes, rhubarb, roses, etc.

The aphids on mangolds and allied plants, F. V. THEOBALD (*Jour. Bd. Agr. [London]*, 19 (1913), No. 11, pp. 914-922, pl. 1, figs. 3).—This continuation of the paper previously noted (*E. S. R.*, 28, p. 252) deals with the boat gall or green mangold aphid (*Aphis atriplicis*) and several species of lesser importance, namely, the allied green mangold aphid (*Rhopalosiphum betæ* n. sp.), the short-siphoned mangold aphid (*A. brevisiphona* n. sp.), and the teasel aphid (*A. ochropus*). A brief discussion of preventive and remedial measures for the mangold, bean, and beet aphid is appended.

The walnut mealy bug (*Pseudococcus bakeri*), R. S. VAILE (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 6, p. 554).—This paper is supplementary to that by Essig previously noted (*E. S. R.*, 25, p. 53).

"The known host plant list at present is as follows: Walnut, apple, pear, orange, lemon, pomelo, elder, cottonwood, southern California black walnut, nightshade, and a few of the ornamental shrubs. It has been found in 3 localities in Ventura County infesting citrus trees, but in 2 of these cases it occurs in much greater numbers on the native elder and nightshade surrounding the trees. For at least a portion of the year it lives primarily on the roots of these 2 plants. Numerous *Solanum* bushes growing under orange trees have been found with the roots thickly covered with all stages, from eggs to mature adults. The same has been true of the elder, though so far no specimens have been reported on roots of citrus or other fruit trees."

The life history appears to be much the same as that of *P. citri*.

The yerba santa mealy bug (*Pseudococcus yerba-santæ* n. sp.), E. O. ESSIG (*Jour. Ent. and Zool.*, 5 (1913), No. 2, pp. 85-87, figs. 2).—This coccid feeds upon the foliage of the yerba santa or mountain balm (*Eriodictyon californicum*) in Ventura County, California. The larva of the syrphid fly *Baccha lemur* preys upon the eggs and young, and the small internal parasite *Leucopis bella* attacks half-grown and adult females.

Papers on insects affecting vegetable and truck crops.—The striped beet caterpillar (*Mamestra trifolii*), H. O. MARSH (*U. S. Dept. Agr., Bur. Ent. Bul.* 127, pt. 2, pp. 13-18, pl. 1, figs. 2).—This paper is based upon observations made in the Arkansas Valley in Colorado and Kansas during the years 1909 to 1912, inclusive.

The striped beet caterpillar or clover cutworm, while ordinarily of minor importance as a beet pest, some years develops in sufficient numbers to cause noticeable damage. During June, 1911, some 75 acres of small beets in various portions of the valley were observed by the author to be stripped of their foliage. In addition to sugar beets, which appear to be the favorite food, the larvæ are found on lamb's-quarters (*Chenopodium album*).

There are 3 generations in the Arkansas Valley each year. The first moths appear during the latter half of May. The first generation develops during the first part of July and moths of the second generation appear during the latter part of August. The larvæ of the third generation mature late in the fall, and the pupæ which develop live through the winter in cells in the soil. The author finds that eggs of the first generation deposited May 20 required 5 days, the larvæ 22 days, and the pupæ 19 days for transformation. Eggs of the second generation deposited July 5 required 6 days, the larvæ 19 days, and the pupæ 15 days for transformation. A moth captured on September 17 deposited 504 eggs in the 6 days from September 19.

The natural enemies mentioned include the braconids *Microdus inedius*, *Meteorus* sp., and an undetermined species; a tachinid (*Phorocera claripennis*), a pentatomid (*Perillioides bioculata*), and a spider (*Phidippus coloradensis*).

Since the pupæ are formed in earthen cells near the surface of the soil in the beet fields, cultivation or plowing out the beets at harvest time crushes or exposes them to the weather, thus acting as an efficient check. When the pest occurs in injurious numbers the larvæ can be easily controlled by spraying with Paris green.

Papers on insects affecting vegetable and truck crops.—The spotted beet webworm (*Hymenia perspectalis*), F. H. CHITTENDEN (*U. S. Dept. Agr., Bur. Ent. Bul.* 127, pt. 1, pp. 11, pls. 4, figs. 3).—This paper presents a brief account of *H. perspectalis*, which is an enemy of the sugar beet and of ornamental plants both in the garden and greenhouse. Thus far this webworm has been reported as occurring in injurious numbers at Brooklyn, N. Y., and Washington, D. C., only.

In addition to the sugar beet it attacks Swiss chard, *Telanthera versicolor*, *Achyranthes acuminata*, etc. The larvæ appear to be nocturnal or practically so, rarely being seen during the daytime, during which time they conceal themselves about the bases of the plants near the roots and under portions of leaves or petioles which rest on the ground. The author observed larvæ which transformed to pupæ October 4 emerging as moths on October 25, while one which pupated October 16 emerged October 31.

Since injury has never been observed to take place until the autumn, and none of the stages have been observed to pass the winter successfully, the author thinks it doubtful if this species really hibernates as far north as the District of Columbia.

Brief notes are given on several associated insects, namely, the yellow-necked flea beetle (*Disonycha mellicollis*), the spinach flea beetle (*D. xanthomelæna*), and the Hawaiian beet webworm (*H. fascialis*).

The natural enemies mentioned are the spined soldier bug (*Podisus maculiventris*) and a small braconid (*Hemiteles* sp.).

A bibliography of 8 titles is appended.

Notes on cotton moths, H. G. DYAR (*Insecutor Inscitiæ Menstruus*, 1 (1913), No. 1, pp. 12).—A table is given for the separation of the 27 species the larvæ of which feed on cotton in America. These belong to the genera Alabama (1), Cosmophila (1), Gonitis (2), and Anomis (23). One species of Gonitis and 7 of Anomis are described as new.

Maize pests, C. R. JONES (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 3, pp. 115–117, fig. 1).—The larvæ of 3 distinct species of Noctuidæ, namely, *Prodenia litteralis*, *Spodoptera mauritia*, and *Chlorida obsoleta*, have thus far been found injuring corn in the Philippines.

The codling moth and one spraying in the Hudson Valley, E. P. FELT (*Jour. Econ. Ent.*, 6 (1913), No. 2, pp. 173–177).—This is a report of the work carried on during 1912 in continuation of that conducted during the previous 3 seasons (E. S. R., 28, p. 156).

The work emphasizes the conclusions drawn in the paper previously noted that for the Hudson Valley at least, in normal seasons when the crop is abundant or fairly so, one thorough early spraying within a week or 10 days after the blossoms fall should result in securing from 95 to 98 per cent of sound fruit. The author's records show that the benefit resulting from 2 later sprayings is comparatively small so far as controlling the codling moth is concerned, though ample to meet the cost of the poison and, in many instances, probably the expense of treatment.

Life histories of Syrphidæ, Part V, C. L. METCALF (*Ohio Nat.*, 13 (1913), No. 5, pp. 81–93, figs. 30).—This fifth paper (E. S. R., 28, p. 254) deals with *Syrphus xanthostoma* (the so-called Pemphagus-gall syrphus fly), *Eristalis æneus*, and *Didea fasciata fuscipes*.

The larvæ of *S. xanthostoma* studied were collected in July on the poplar (*Populus tremuloides*) in the well-known, characteristic galls on the ends of the twigs, made by *Pemphagus vagabundus*. Of 3 specimens taken on July 7, 1 pupated on July 11 and the other 2 the following day; the former emerging as an adult on July 18 and the latter 2 on July 20.

An adult of *E. æneus* collected deposited about 100 eggs within 1½ hours, a considerable number hatching within 24 hours. Numerous larvæ were collected in evaporating vats at a sewage disposal plant in September. They were found in large numbers floating about in the very putrid, watery material, their food undoubtedly being the various decaying materials in the sewage. Pupæ taken about the middle of September emerged as adults September 26, so that the duration in this stage was at least 10 days to 2 weeks.

The eggs of *D. fasciata fuscipes* were found scattered singly along the underside of the low, spreading, more or less horizontal branches of the sycamore (*Platanus occidentalis*) at a time in fall when the colonies of aphids (*Longistigma caryæ*) were just being established. Larvæ apparently 5 or 6 days old were taken on sycamores at Columbus on September 28, 1911.

The life history of a bee fly (*Spogostylum anale*) parasite of the larva of a tiger beetle (*Cicindela scutellaris* var. *lecontei*), V. E. SHELFORD (*Ann. Ent. Soc. Amer.*, 6 (1913), No. 2, pp. 213–225, figs. 17).—This paper is based upon the collection and rearing to maturity of about 2,000 host larvæ, some 7 per cent of which were found to be parasitized.

"The adult fly deposits eggs at the edge of circular openings in sand. In the areas inhabited by the flies (near Chicago) these openings are usually the larval burrows of *C. scutellaris lecontei*. The sight of the burrow opening beneath the eyes appears to call forth the egg laying reflex. The larvæ live as ectoparasites upon the tiger beetle larvæ for little less than one year, growing slowly and molting several times. When the host is ready to pupate the larva molts, moves to the abdomen, and grows to adult size in about 6 days. When the pupa is fully mature it digs out by means of hooks on its head and backward projecting bristles on the abdomen. The digging is sometimes downward for a time and lasts for more than 24 hours."

The parasite is said to be more widely distributed than is this beetle.

Some earlier observations on the habits of *Aphiochaeta juli*, F. KNAB (*Insector Inscitiae Menstruus*, 1 (1913), No. 2, p. 24).—A brief note on the parasitism of myriapods by this phorid.

Dissemination of the leprosy bacillus by the house fly, A. LEBEUF (*Bul. Soc. Path. Exot.*, 5 (1912), No. 10, pp. 860-868).—The author finds that the house fly can absorb enormous quantities of the leprosy bacillus through nourishing itself on the ulcers. Leprosy bacilli can be obtained in abundance in an apparently virulent condition from the dejections of infested flies. While multiplication does not appear to take place in the digestive tube of *Musca domestica*, the bacillus does not lose its vitality. Thus it appears that *M. domestica* may perhaps play an important rôle in the spread of leprosy through depositing its excrements upon certain mucous membranes or abrasions of the skin of healthy persons living in the immediate vicinity of leprosy patients with open lesions.

Stomoxys calcitrans, Part II, C. K. BRAIN (*Ann. Ent. Soc. Amer.*, 6 (1913), No. 2, pp. 197-202, figs. 8).—This continuation of the paper previously noted (E. S. R., 27, p. 159) deals with the circulatory, nervous, and reproductive systems, habitat, etc.

Biological studies of the pomace fly (*Drosophila ampelophila*), E. GUYÉNOT (*Compt. Rend. Soc. Biol. [Paris]*, 74 (1913), Nos. 2, pp. 97-99; 4, pp. 178-180; 5, pp. 223-225; 6, pp. 270-272; 7, pp. 332-334, fig. 1; 8, pp. 389-391; 9, pp. 443-445).—These several contributions take up (1) the possibility of an aseptic life for the individual and her progeny; (2) the rôle of yeasts in alimentation; (3) change of medium and adaptation; (4) nutrition of the larvæ and fecundity; (5) nutrition of the adults and fecundity; (6) resorption of spermatozooids and abortion of the eggs; and (7) the determination of oviposition.

The mango bark borer (*Plocæderus ruficornis*), C. R. JONES (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 3, pp. 118-124, pls. 3, fig. 1).—It is stated that in the vicinity of Manila many of the finest specimens of the mango have already been killed and scores of others are dying from the attacks of this cerambycid beetle.

The passing of the hickory nut? H. BIRD (*Jour. N. Y. Ent. Soc.*, 21 (1913), No. 2, pp. 123-126).—The author considers it impossible to induce landowners to act in unison in cutting and burning infested trees during the winter and spring in order to destroy the larvæ of the hickory bark borer (*Scolytus quadrispinosus*) as has been advocated. He thinks that saving treatment must be confined to parks, lawns, and preserves where the owner is willing to incur some expense and the management is under competent supervision. Two methods of treatment are suggested, the first consisting in the use of a repellent, such as whale-oil soap, at the time the beetles are ovipositing; the second that of treating the holes leading to the egg cells with something that will destroy the eggs and not injure the trees, such as gasoline. The latter is not quite the

task it might seem since the females oviposit only in the trunk and out on the branches till they get down to about $1\frac{1}{2}$ in. in diameter. The author reports that trees 40 ft. high, punctured by between 200 and 300 females for their egg cells were thoroughly treated in 3 hours by means of a small squirt can oiler and a quart of gasoline, with no injury to the trees. He recommends that valuable trees be treated by means of a repellent, which, if ineffectual, can be followed by a treatment of the egg cells.

The cigarette beetle (*Lasioderma serricorne*) in the Philippine Islands, C. R. JONES (*Philippine Jour. Sci., Sect. D*, 8 (1913), No. 1, pp. 1-42, pls. 9).—This paper discusses the distribution and dissemination, life history, and natural and artificial control, including fumigation experiments with carbon disulphid and hydrocyanic acid gas. No bad effect upon the aroma of the fumigated cigars could be detected.

The annual loss caused by this beetle in Manila is said to vary from \$3,000 to \$6,500 per factory for cigars actually destroyed therein. Mention is made of the rice weevil, a species of Bostrychidæ, the shot-hole bamboo borer (*Dinoderus brevis*), and a clerid beetle as being found in dried tobacco in the Philippines and often mistaken for the cigarette beetle. The species of Cleridæ mentioned is said to be an important enemy of the cigarette beetle through feeding, both in its larval and adult stages, upon the larva and pupa of this pest. In observations made 6 adult clerids devoured 31 larvæ of the cigarette beetle in a single night. A chalcidid parasite (*Norbanus* sp.) has been reared by the author from the pupa of the cigarette beetle, which it attacks only after the pupal cell is formed. The life cycle of this parasite is said to require from 16 to 17 days. A small white mite of the family Eupodidæ (*Rhagidia* sp.) attacks this pest in all stages except the adult, both in factories and in the laboratory.

A wild host plant of the boll weevil in Arizona, O. F. COOK (*Science*, n. ser., 37 (1913), No. 946, pp. 259-261).—*Thurberia thespesioides*, a plant closely related to the cotton plant, originally described in 1855 from Sonora, Mexico, and recently found growing on slopes of the Santa Catalina Mountains not far from Tucson, Ariz., is reported to be a host plant of the boll weevil. *Thurberia*, some dozen plants of which were found growing in a small canyon, is a large shrubby plant with hard woody trunk an inch in diameter which may attain a height of 10 ft. Six definite rings of annual growth were found in one specimen.

A few larvæ and pupæ were discovered embedded among the seeds of nearly mature capsules and an adult weevil in one capsule. Since it seems to be a habit of *Thurberia* to flower and fruit for only a short time in September and October, it does not allow more than 1 or 2 broods of the weevil to develop in a season.

Thurberia may prove to be the original host plant of the boll weevil, as otherwise its infestation at Tucson must be explained by reference to prehistoric cotton cultures which might have brought the weevil in from Mexico. That the weevils in the Santa Catalina Mountains represent a recent importation from Texas seems to be altogether improbable as no cotton is grown in this vicinity.

Bee keeping in Tennessee, G. M. BENTLEY (*Tenn. Bd. Ent. Bul.* 9, 1913, pp. 64, figs. 56).—This bulletin gives information needed by those about to engage in bee keeping.

A revision of the North American species of *Megastigmus*, C. R. CROSBY (*Ann. Ent. Soc. Amer.*, 6 (1913), No. 2, pp. 155-170, figs. 10).—Ten species of this chalcidid genus are recognized of which 3 are described as new. So far as known the larvæ of all the species live in the seeds of plants.

A new hymenopterous parasite on *Aspidiotus perniciosus*, D. G. TOWER (*Ann. Ent. Soc. Amer.*, 6 (1913), No. 1, pp. 125, 126).—A new parasite of the San José scale reared at Amherst, Mass., is described as *Prospaltella perniciosi*.

The use of flour paste in lime-sulphur solutions in the control of the citrus red spider, J. D. NEÜLS (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 6, p. 557).—Experiments are said to indicate that the addition of flour paste to lime-sulphur solution will eliminate the necessity of washing the fruit on account of spotting. The distribution of lime-sulphur is so even when the flour paste is added that it spreads over the surface of the leaves and fruit in a thin film and very little spotting occurs. When the paste is used there is no clogging, either in the pumps or at the nozzle, and a 200 gal. tank of the spray with the flour paste added will cover more trees than will the lime-sulphur alone.

Suggestions on preparation and use of spray formulas, G. M. BENTLEY (*Tenn. Bd. Ent. Bul.* 10, 1913, pp. 24, figs. 8).—General information is given on the control of insects, fungi, and other pests.

FOODS—HUMAN NUTRITION.

Changing oils into fats (*Quart. Bul. Bd. Health N. H.*, 2 (1913), No. 2, pp. 31, 32).—It is claimed that the chief factor governing the consistency of any oil or fat, such as cotton-seed oil or corn oil, is the relative proportion present of the glycerids of stearic and oleic acids, the olein as a rule predominating in the liquid oils, while in the solid fats stearin is generally the chief constituent.

The chief chemical characteristic of olein is that, unlike stearin, it is an unsaturated compound. Through the chemical absorption of gaseous hydrogen by a liquid oil, stearin results. The combination of the hydrogen with the olein is accomplished by means of a catalyzer. "In practice, the process merely consists in conducting hydrogen gas into an oil, such as cotton-seed, which has been warmed to the proper temperature and which has had suspended in it, as the 'catalyzer,' a quantity of finely divided metallic nickel. The resulting consistency ranges from that of a semifluid oil to a hard firm fat, depending upon the point to which the process is carried. For conversion to the consistency of lard the addition of approximately 1 per cent only of hydrogen is required.

"There is no reason for believing that fats thus prepared from edible oils are other than perfectly wholesome. The single hygienic question thus far raised is in connection with the trace of nickel that ordinarily remains combined in the finished product and which therefore can not be filtered out."

It is stated that examination of a commercial lard substitute, believed to be a product of this character, failed to show the presence of such metal.

Mention is also made of the modern application of this oil-hardening process to the soap industry and to the manufacture of lubricants. "There are certain very cheap oils that have hitherto not been adapted to soap making. By means of hydrogenation, however, not only are objectionable, odoriferous constituents eliminated but the preparation of a much harder, and therefore more valuable soap, is made possible."

Plant fats, C. THOMAE (*Jour. Prakt. Chem., n. ser.*, 87 (1913), No. 3, p. 144; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 605, I, p. 326).—According to the author's investigations, the fatty and waxy constituents of yeast and roses, of the skins of apples, grapes, peaches, potatoes, lemons, and gherkins, and of other parts of plants may be readily isolated in a state of purity by heating under diminished pressure.

Sugar and its value as food, MARY H. ABEL (*U. S. Dept. Agr., Farmers' Bul.* 535, pp. 32).—The chemical composition and characteristics of sugars of different

kinds, commercial glucose, and other similar products made from starch, the source and quality of sugars, the food value of sugar, table sirups, molasses, and sugar cane, and similar questions are discussed, as well as the practical use of sugar in the ordinary dietary and in the dietary of children.

In its present form this bulletin is an extension and revision of an earlier Farmers' Bulletin of similar title (E. S. R., 11, p. 278).

The sterilization of confiscated meat from tuberculous animals (*Bul. Off. Internat. Hyg. Pub.* [Paris], 4 (1912), No. 3, pp. 481-491).—Sterilization is accomplished by heating with steam under pressure for 2 hours at a minimum temperature of 110° C.

Data of importance in detecting an excess of added water in goods made from finely chopped meat, E. FEDER (*Ztschr. Untersuch. Nahr. u. Genussmitl.*, 25 (1913), No. 10, pp. 577-588).—Analytical and other data are summarized and discussed in this paper on the detection of a surplus of added water in chopped meat and sausage.

Investigation of Louisiana rice with reference to the etiology of beri-beri, WELLMAN, BASS, and EUSTIS (*New Orleans Med. and Surg. Jour.*, 65 (1912), No. 3, pp. 197-206; *abs. in Zentbl. Biochem. u. Biophys.*, 14 (1913), No. 23, p. 909).—Polished Louisiana rice induced polyneuritis in fowls as did both sugar and cornstarch, the former more quickly and the latter more slowly than the rice.

Beri-beri and freshly decorticated rice, FARGIER (*Ann. Hyg. et Méd. Colon.*, 15 (1912), No. 3, pp. 491-497; *abs. in Zentbl. Biochem. u. Biophys.*, 14 (1913), No. 23, p. 910).—The disease disappeared amongst soldiers in Anam when red rice was substituted for white.

[Rice and] beri-beri in Tonkin, GOUZIEN (*Ann. Hyg. et Méd. Colon.*, 15 (1912), No. 3, pp. 445-491; *abs. in Zentbl. Biochem. u. Biophys.*, 14 (1913), No. 23, pp. 909, 910).—The substitution of fresh hand-milled rice for white rice checked the disease in prisoners.

Soluble nitrogenous matter as a factor in the valuation of flours, E. ROUSSEAU and M. SIROT (*Compt. Rend. Acad. Sci.* [Paris], 156 (1913), No. 9, pp. 723-725).—It is noted that many flours, which the ordinary chemical analysis shows to be normal, do not make good bread when subjected to baking tests.

As the result of experiments here reported, the authors have attached considerable significance to the value of the ratio of total nitrogen to soluble nitrogen as a criterion of the quality of the flour. They found that in the case of good flours this ratio was about 5.72 and that if lower than 5.20 the flour gave trouble in baking.

Poisonous properties of khadi-ferment [used in bread making], J. BURTT-DAVY (*Union So. Africa Dept. Agr. Rpt.*, 1910-11, pp. 244, 245).—The root of *Mesembrianthemum mahoni*, after paring, drying, and powdering, is used to some extent in South Africa as a substitute for yeast in bread making and for fermenting Kafir beer. It is apt to prove injurious, and the unprepared root also appears to have toxic properties.

According to the results of analyses made at the Imperial Institute, South Kensington, the dried roots contain oxalates equivalent to 3 per cent of oxalic acid, to which the poisonous effects are doubtless due. "In view of these results it is not desirable that the roots of this plant should be used as a substitute for yeast in making bread. The fermenting power is due to the presence of a fungus on the roots. The activity of the material in inducing fermentation seems to vary considerably in different specimens, so that it may be necessary occasionally to use an unduly large proportion of the powdered root in bread making, and in these circumstances poisoning might ensue."

The author states that he has found that the roots of another plant are used by farmers as a substitute for yeast in the Eastern Province, under the name of "T"Kirriemoor," and that this will be studied to determine whether or not oxalates are present in sufficient quantity to be injurious.

A recent analysis of asparagus (*Lancet* [London], 1913, I, No. 18, pp. 1257, 1258).—Data regarding analytical work carried on under the auspices of the *Lancet* are summarized.

Approximately 1/10 of the raw asparagus shoot is solid matter and of this as much as 70 per cent is soluble in cold water and 80 per cent in boiling water, the constituents thus removed consisting of sugars, gums, proteids, and practically all the phosphoric acid salts. The sugar in asparagus amounts, on an average, to 3.6 per cent; the proteids to 3.8 per cent; the fiber to 1 per cent; the fat to 0.5 per cent; and the mineral matter to 0.8 per cent. "The green variety contains much less fiber than the white, and the green also yields more soluble matter to boiling, and still more to cold, water than the fat white stick. An important constituent, again, of the tender shoot of asparagus is the basic body vitamin. This occurs in the growing tips of all vegetables, but particularly so in that of asparagus."

The botanical relation of asparagus to the onion family is pointed out, and it is stated that, "when the tender shoots of asparagus are left in water for a few days we find that the smell of onions quickly develops and after a time becomes very marked. Again, if asparagus is extracted with ether an oil is obtained which has a faint smell of the raw shoot. This oil, on analysis, proves to contain sulphur. It is probably this sulphur constituent which gives the well known peculiar odor to the kidney excretion after a diet of asparagus, and not the other principle peculiar to asparagus, asparagin."

It is pointed out that asparagus, after boiling for 20 minutes, contains too little nutritive material to make it of any special importance as a foodstuff, though it is valuable as a pleasant adjunct to the meal, and so an undoubted aid in the processes of nutrition. The possibility of saving nutritive material extracted in cookery by making asparagus soup is pointed out.

Fungus flora of South Africa [edible fungi], I. B. P. EVANS (*Union So. Africa Dept. Agr. Rpt.*, 1910-1911, p. 259, pls. 3).—As a part of his report as plant pathologist and mycologist, the author gives data regarding edible fungi found locally. The results of his observations and experiments, so far as they have gone, indicate that the edible species greatly outnumber those of a doubtful or harmful nature.

"In fact they have brought to light the interesting phenomenon that quite a number of the very best of edible fungi such as *Coprinus comatus*, *Tricholoma personatum*, *Lepiota procera*, *Psalliota campestris*, and *Morchella esculenta* occur commonly in South Africa. Up to the present no truffles have been recorded, although several underground fungi closely resembling them in external appearance, such as *Rhizopogon luteolus*, have been submitted for examination."

[The chayote or vegetable pear (*Sechium edule*) and the maranko (*Lagenaria vulgaris*)], J. BURT-DAVY (*Union So. Africa Dept. Agr. Rpt.*, 1910-11, p. 242, pls. 2).—Brief notes on the use of the maranko fruit and the chayote fruit and root as a vegetable are presented.

The chayote seems to produce a fiber of some textile value.

Constituents of apples, C. THOMAE (*Jour. Prakt. Chem.*, n. ser., 87 (1913), No. 3, pp. 142-144; abs. in *Jour. Chem. Soc.* [London], 104 (1913), No. 605, I, pp. 327, 328).—The results of a study of the ether extract of apple skins are reported.

Popularity of banana food products, O. W. BARRETT (*Philippine Agr. Rev.* [English Ed.], 6 (1913), No. 3, pp. 137-139).—This article discusses briefly the

manufacture and use as food of dried bananas, banana chips, flour, and meal, and "fig bananas."

Some results obtained in studying ripening bananas with the respiration calorimeter, C. F. LANGWORTHY and R. D. MILNER (*U. S. Dept. Agr. Yearbook 1912*, pp. 293-308).—Data regarding the changes which take place in ripening bananas are summarized, and the results of an experimental study of the ripening of this fruit made with a respiration calorimeter of special construction (*E. S. R.*, 27, p. 568) briefly reported.

The results which have been obtained show that the ripening changes progress regularly to a maximum and then decline; that at its greatest intensity the heat production is equivalent to approximately 1 calorie per hour per kilogram of bananas. "The heat liberated is a measure of the activity of one or more of the ripening processes. Analysis has shown that during ripening the banana starch is transformed into cane sugar and the cane sugar into invert sugar, and that there are important changes in the character of the tannin compounds, and that other changes occur, brought about by the production of aroma and flavor bodies, and perhaps in other ways. It has also been found that in addition to the transformation of carbohydrates there is an actual loss of this food constituent during ripening. From the data for oxygen consumption, carbon dioxide, and heat output it appears that the heat liberated by the ripening bananas is largely due to the destruction of carbohydrate." The results which are reported and discussed represent only part of the experimental data which have been accumulated. "No attempt is made at this time to draw deductions regarding the practical applications which can be made, as this may be done more properly when experiments now under way are completed."

The chemical composition of Florida oranges, A. M. HENRY (*Fla. Quart. Bul. Dept. Agr.*, 23 (1913), No. 2, pt. 2, pp. 53, pls. 2).—This publication reports the results of a chemical examination of fruit in various stages of ripeness from the principal orange growing districts of the State.

Full analytical data, together with methods of analysis, are given. It was found that fruit which contained not over 1.25 per cent of acid was always edible and desirable, and as a result of this investigation the following standard was recommended: "Orange, sweet orange, is the ripe, mature fruit of *Citrus aurantium*, the juice of which contains not more than 1.25 per cent by weight of total acid, determined as crystallized citric acid."

Raisins, figs, and other dried fruits and their use, C. F. LANGWORTHY (*U. S. Dept. Agr. Yearbook 1912*, pp. 505-522).—Information is summarized regarding the preparation and use of dried and evaporated fruits, including apples, pears, prunes, peaches, apricots, cherries, raisins, figs, citron, dates, and others; the food value of dried fruits; ways of using them; and similar topics. The great importance of the American dried fruit industry is spoken of.

"Whether used by themselves as substitutes for fresh or preserved fruits, or mixed into cakes, puddings, confectionery, and other dishes, dried fruits offer a wholesome, nutritious, and economical way of securing variety in the diet, and are specially useful where the supply of fresh fruits is limited, or where storage space for fresh fruits is lacking."

Ground cinnamon and cassia, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul.* 251, 1913, pp. 29).—Analytical data are given regarding 250 samples purchased in all parts of Canada.

Ground cloves, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul.* 252, 1913, pp. 23).—Continuing earlier work (*E. S. R.*, 21, p. 361), a large number of samples of cloves were examined and a scheme of standards for ground cloves suggested.

Ground white pepper, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul.* 250, 1913, pp. 35).—The results are given of the examination of 273 samples purchased in the different provinces of Canada.

The nature of tea infusions, H. L. SMITH (*Lancet [London]*, 1913, I, No. 12, p. 846).—This article reports and discusses data regarding the combination of the caffeine and tannin in tea infusions.

"In the hot tea infusion it may be concluded that caffeine and tannin occur considerably hydrolyzed and in the free state."

Experimental methods are described.

The nature of tea infusions (*Lancet [London]*, 1913, I, No. 12, p. 844).—A discussion of the above and earlier work.

Food substances.—Accessories to human food, D. HOOPER (*Ann. Rpt. Bd. Sci. Advice India*, 1911-12, pp. 17-19).—Analyses are reported of bamboo seed, salep (the dried corms or tubers of species of orchid), and *Amorphophallus* tubers, and some data given regarding food accessories, including tea and Abor tea.

Nineteenth annual report of the dairy and food commissioner of the State of Michigan for the year ending June 30, 1912, G. M. DAME (*Ann. Rpt. Dairy and Food Comr. Mich.*, 19 (1912), pp. 252, figs. 7).—Analytical data are reported by F. L. Shannon regarding samples of miscellaneous foods, drugs, and dairy products examined, together with a report of inspection work and several papers on food and dairy topics including, among others, Formic Acid as a Preservative of Fruit Sirups, by F. L. Shannon; Clean Cows and Clean Stables, by J. W. Helme; Production of Clean and Sound Milk, by C. V. Jones; and Caring for Cream at the Farm, by C. V. Jones.

[Food analyses], J. HORTVET (*Minn. Dairy and Food Dept. [Bien.] Rpt. Chem.*, 14 (1911-12), pp. 183).—General and analytical data are given regarding a large number of illegal samples.

The nutritional importance of the presence in dietaries of minute amounts of certain accessory substances, E. A. COOPER (*Brit. Med. Jour.*, 1913, No. 2727, pp. 722-724).—A summary and digest of the knowledge concerning the importance of certain substances in the cause and prevention of beri-beri and scurvy.

Studies on beri-beri—further facts concerning the chemistry of the vitamin-fraction from yeast, C. FUNK (*Brit. Med. Jour.*, 1913, No. 2729, p. 814, pl. 1).—In the treatment of experimental polyneuritis the best results were obtained by the administration of the whole vitamin-fraction.

The righting of certain errors concerning normal nutrition, A. GAUTIER (*Rev. Sci. Paris*, 51 (1913), I, No. 21, pp. 641-648; *abs. in Ilus. London News [Amer. Ed.]*, 52 (1913), No. 1364, p. 894).—In this discussion the author has summarized data regarding the average food consumption in Paris and other similar information.

Foods and food values, with suggestions how to reduce the cost of living, G. M. DAME ET AL. (*Mich. Dairy and Food Dept. [Pamphlet]*, 1912, pp. 29, figs. 15).—Popular information is given regarding the composition of foods and the relative cost and nutritive value of a number of food products, together with a short discussion of the food value of the potato.

The food and diet charts issued by the U. S. Department of Agriculture (E. S. R., 24, p. 67) are reproduced in black and white.

Basic dietary ration tables and waste accounting system, C. S. PITCHER (*Institution Quart. [Ill.]*, 4 (1913), No. 1, pp. 129-143).—Advantages derived from the use of basic dietary ration tables and the waste accounting system are pointed out, the data being presented in continuation of work previously presented.

Report upon the study of the diet of the laboring classes in the city of Glasgow carried out under auspices of the corporation of the city, DOROTHY E. LINDSAY (*Glasgow, 1913, pp. 100; rev. in Brit. Med. Jour., 1913, No. 2726, pp. 647, 675; Lancet London, 1913, I, No. 18, pp. 1255, 1256; Jour. Amer. Med. Assoc., 61 (1913), No. 13, pp. 1046, 1047*).—The 60 families investigated were in the poorest districts of Glasgow, the weekly income varying from \$3.25 to \$15, being in some cases regular and in others irregular. They were grouped according to the amount of income. The kind and amount of food, the proportion of income expended for different foods, and other data are reported and discussed.

The principal foodstuffs used were found to be bread, potatoes, beef, milk, sugar, and vegetables, two-thirds of the protein being of vegetable origin. Very little oatmeal, peas, or beans was used, while cheese was eaten in very small amounts.

As a result of the investigations, the author concludes that bad marketing is one of the main contributing factors to the unsatisfactory dietary conditions, as are also bad selection and bad cooking, and advocates proper school training in cooking and marketing as the best remedy. A freer use of cheese and vegetables rich in protein, like beans, peas, and oatmeal is advocated. That there is difficulty in preparing these foods is admitted. However, "if the diet of the laboring classes is to be improved without increasing the cost, time and labor must be expended on properly cooking these more nutritive vegetable foods."

The report also includes the results of work carried out in cooperation with Chalmers and Roberts on the physique of children in relation to diet. It was found, that when the weight of a child was much below the average for its age, almost without exception the diet was inadequate. An attempt was also made to ascertain what part an inadequate diet played as a cause of rickets, but the data secured were not sufficient for definite conclusions. It was noted, however, that rickets was found in families in which there was overcrowding.

D. Noël Paton, under whose supervision the work was carried on, contributes an introduction to the report.

[Menus for family meals], C. H. SENN (*Cookery Ann. and Year Book Univ. Cookery and Food Assoc. [London], 19 (1913), pp. 136, figs. 45*).—Menus for 7 days in each month in the year are suggested for family meals.

A brief note is given regarding the London County Council Technical Cookery School for Boys. The report of the Universal Cookery and Food Association and similar data are also included in this volume.

Menus for boys from 14 to 16 years old (*Boston Cooking-School Mag., 18 (1913), No. 1, pp. 42-44*).—Two series of menus for one week are given, one series in a simplified as well as a more elaborate form. The use of the menus is very briefly discussed.

Remarks on the food requirements of children, C. WATSON (*Brit. Med. Jour., 1913, No. 2725, pp. 603-605*).—Analyses of the daily rations of several children, aged from 4 to 7 years and of good social circumstances, showed the average composition to be 72.1 gm. protein, 69.1 gm. fat, and 198.4 gm. carbohydrate, with an energy value of 1,751 calories.

Judging from the physical condition of the children, the author believes this to be more nearly a correct standard than one derived from the Atwater standard for a man. The importance of the form, digestibility, and purity of children's food rather than its chemical composition alone is emphasized. School lunches furnished to the poorer children in Edinburgh are described, by means of which nearly half of the daily food requirements of the children may be furnished at small cost.

Importance of suitable meals and dietary in higher education, A. A. MUMFORD (*Jour. State Med., 21 (1913), No. 5, pp. 290-297*).—The importance of ade-

quate amounts of protein and fat in the diets of children is emphasized, together with the need of cooperation of the school with the home to secure the proper nourishment of children between the ages of 13 and 18 years.

Suggestions are given for the preparation and serving of school dinners.

Malnutrition in school children—a clinical report, B. I. WYATT (*Chicago Med. Recorder*, 35 (1913), No. 5, pp. 282, 283, fig. 1).—The 24 children, on an average 12 years old, selected for the test, were anemics, pretuberculous, and, in general, those suffering from various forms of malnutrition, who had been under observation for some time and had been given additional food, fresh air, exercise, rest, etc.

During the test they were given 12 gm. of an iron albumate in their food each day. Some showed a gain in weight and others did not, but a marked increase in the amount of hemoglobin in the blood was noticed during the period in which the iron albumate was given.

Report of Missouri Home-Makers' Conference Association, 1913 (*Missouri Bd. Agr. Mo. Bul.*, 11 (1913), No. 3, pp. 130, figs. 40).—Among the papers presented at this meeting were the following: The Feeding of Children, by Amy L. Daniels, which gives menus for 7 days arranged to accord with dietary standards for children of different ages; Hot Lunches in Rural Schools, by Mrs. Fannie Quick; School Sanitation, by Louise Stanley; Farm Home Management, by O. R. Johnson; Farm Home Management, by Mrs. J. E. Hall; and Self-Rising Bread, by Winona Woodward.

Proceedings of the Middle Tennessee Home-Makers' Association, December 5-7, 1911 (*Proc. Middle Tenn. Farmers Inst.*, 10 (1911), pp. 121-159; in *Tenn. Bien. Rpt. Dept. Agr. 1911-12*).—This report contains the proceedings and papers presented, among others the following: Household Efficiency, by Catharine A. Mulligan; Home Conveniences, by Mrs. J. T. Stratton; How to Make the Farmer's Home More Comfortable, by Mrs. R. W. Nichol; and The Rural School, the Social Center of Country Life, by Mrs. G. Williams.

Proceedings of the Middle Tennessee Home-Makers' Association, December 3-5, 1912 (*Tenn. Agr.*, 1 (1913), No. 9, pp. 487-509, figs. 3; in *Tenn. Bien. Rpt. Dept. Agr. 1911-12*).—The proceedings and papers presented included, among others, the following: Cooperation Between City and Country Women, by Mrs. A. B. Cooke; The Care of Children in the Home, by Mrs. T. G. Settle; and School Lunches, by Della Stroud.

On the absorption of nitrogenous products—a reply to Abderhalden and Lampé, O. FOLIN and W. DENIS (*Jour. Biol. Chem.*, 14 (1913), No. 5, pp. 453-455).—A controversial article.

On the tyrosin content of proteins—a reply to Abderhalden and Fuchs, O. FOLIN and W. DENIS (*Jour. Biol. Chem.*, 14 (1913), No. 5, pp. 457, 458).—A controversial article.

Contribution to the question of the mechanism of the action of fats as exciters of pancreatic secretion, B. P. BABKIN and H. ISHIKAWA (*Pflüger's Arch. Physiol.*, 147 (1912), No. 6-7, pp. 288-334).—From the large amount of experimental data presented in this article, the conclusion is drawn that pancreatic secretion is excited by the action, through nervous influence, of the soaps and fatty acids resulting from the decomposition of the neutral fat by the gastric juices.

Contribution to the question of the periodic work of the digestive tract, B. P. BABKIN and H. ISHIKAWA (*Pflüger's Arch. Physiol.*, 147 (1912), No. 6-7, pp. 335-348).—The experimental work reported shows that the periodic work of the digestive tract takes place not only when the stomach and duodenum are empty but also if a small quantity of neutral fat or its decomposition products are introduced into the duodenum.

The origin of muscular energy: Thermodynamic or chemodynamic? A. B. MACALLUM (*Proc. Amer. Soc. Biol. Chem.*, 2 (1913), No. 3, pp. 97-111).—According to the author's summary, the cell is at least one degree removed from a thermodynamic machine and may be classed as a chemical engine. In that respect the sarcous disc is also a chemical engine.

"If, consequently, surface tension is the dominant factor in the production of muscular contraction muscle is not a heat engine but a chemodynamic one. The advantage of this point of view over that of the thermodynamic one lies in the fact that the theory concerned seems, in the language of the pragmatist, 'to work' and it enables us to avoid labored explanations of the origin of muscular energy involving the cult of the ion and the semipermeable membrane, or attributing thaumaturgic and inscrutable properties to colloids."

Chemical changes in the nerve fiber during passage of nerve impulse, S. TASHIRO (*Amer. Jour. Physiol.*, 31 (1913), No. 5, *Proc. Amer. Physiol. Soc.*, 25 (1912), pp. XXII, XXIII).—The author has constructed an apparatus with which he states that he is able to detect and estimate carbon dioxide in amounts as small as 1/1,000,000 gm.

This gas is given off by resting nerve and the amount is increased when the nerve is stimulated.

ANIMAL PRODUCTION.

Detailed reports on scientific work, C. B. DAVENPORT (*Carnegie Inst. Washington Year Book*, 11 (1912), pp. 83-90).—This is a report of studies under way on the causes of pigmentation in animals, the origin and heredity of sex, the sex nature of poultry, and the inheritance of plumage characters in fowls.

Heredity and inbreeding, E. FEIGE (*Fühling's Landw. Ztg.*, 62 (1913), No. 9, pp. 322-342).—This is an extended treatise in which the author outlines the earlier theories of Darwin and Weismann, and the later theories of Hertwig, Strasburger, and others with regard to the ontogenic causes for heredity and the general effects of inbreeding. The accomplishments of Colling, Booth, and Bates in shaping the types of Shorthorn cattle are discussed.

Unsound Mendelian developments, especially as regards the presence and absence theory, J. WILSON (*Sci. Proc. Roy. Dublin Soc., n. ser.*, 13 (1912), No. 27, pp. 399-421).—In this treatise the author presents arguments and data tending to show that "(1) the presence and absence theory is unsound; (2) it leads to erroneous conclusions; and (3) phenomena to which it has been applied can be analyzed by ordinary Mendelian formulas."

Interalternative as opposed to coupled Mendelian factors: A solution of the agouti-black color in rabbits, J. WILSON (*Sci. Proc. Roy. Dublin Soc., n. ser.*, 13 (1913), No. 37, pp. 589-599).—In this paper the author resumes the discussion of the "presence and absence" theory and presents the theory of interalternatives as a solution of the agouti-black color in rabbits.

A study of the bacterial flora of the large intestine of the horse, J. CHOUKÉVITCH (*Ann. Inst. Pasteur*, 25 (1911), Nos. 3, pp. 247-276; 4, pp. 345-367, figs. 30).—A study is reported of the bacterial flora of the cecum and colon of the horse. The method used in separating the aerobic and the facultative anaerobic from the strict anaerobic bacteria is described in detail, and the different groups and species of bacteria, many of them being new, are illustrated and described. A bibliography of 72 titles is included.

Researches on the microbial flora of the large intestine of cattle and sheep, J. CHOUKÉVITCH (*Ann. Inst. Pasteur*, 27 (1913), Nos. 3, pp. 246-263; 4, pp. 307-321, figs. 8).—Work with cattle and sheep similar to the above is reported.

New feeds and their value for agriculture, F. HONCAMP (*Mitt. Deut. Landw. Gesell.*, 27 (1912), pp. 635-638; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr.*

Intel. and Plant Diseases, 4 (1913), No. 1, pp. 91-93).—This is a continuation of work previously noted (E. S. R., 28, pp. 170, 464).

A new feed, dry beer yeast, is reported as containing from 40 to 45 per cent of crude protein, and is recommended as a valuable supplementary feed for fattening hogs. This product is said to have a feeding value equal to a mixture of cotton-seed meal, sesame cake, or oil-free soy-bean cake. It was highly digestible with sheep but cows refused to eat it in any form.

New by-products of oil making are *Guizotia oleifera* and Perilla cake, which contain approximately the same protein and fat content as other oil cakes and are equally as digestible. Guizotia cake fed to sheep was unsatisfactory.

Analyses are reported of wheat and rye germs. These are rich in protein, relished by stock, and easily digestible. Analyses and feeding values of various kinds of new leguminous crops are also reported, and an analysis of crude and artificially prepared sawdust, with a discussion of its relation to molasses feed. Sawdust in any form was found to be practically indigestible.

Feeding stuffs (*Dept. Landb., Nijv. en Handel [Netherlands], Verslag. en Meded. Dir. Landb., 1912, No. 5, pp. 33-46*).—The protein and fat content of feeding stuffs are reported as follows: Sesame cake 38.5 and 11.6 per cent; soy-bean cake 42.6 and 5.4 per cent; coconut cake 21.5 and 8.4 per cent; palm-nut cake 16.1 and 7.4 per cent; and sunflower cake 29.5 and 6.9 per cent, respectively.

Composition of some common fodders, A. A. RAMSAY (*Agr. Gaz. N. S. Wales*, 24 (1913), No. 4, pp. 324, 325).—Analyses are reported of green fodders of lucern, barley, wheat, and oats; of oat and wheat hays; and of oat and wheat chaff.

Concentrated commercial feeding stuffs, G. M. DAME (*Ann. Rpt. Dairy and Food Comr. Mich., 19 (1912), pp. 106-127*).—Reports of analyses of miscellaneous poultry feeds, stock feeds, dairy feeds, and mixed feeds are given.

Commercial feeding stuffs, J. HORTVET (*Minn. Dairy and Food Dept. [Bien.] Rpt. Chem., 14 (1911-12), pp. 174-183*).—Analyses are reported of alfalfa meal, blood flour, beef scraps, dried brewers' grains, calf feeds, gluten feeds, miscellaneous mixed feeds, cotton-seed meal, oil meal, flaxseed meal, poultry feeds, rye products, sugar feeds, bran, shorts, middlings, red dog flour, and screenings.

Commercial feeds, G. M. MACNIDER and E. W. THORNTON (*Bul. N. C. Dept. Agr., 33 (1912), No. 11, pp. 5-69*).—Chemical and microscopical analyses are reported of the following concentrated stock feeds: Wheat bran, middlings, shorts, shipstuff, corn chops, rice feeds, beet pulp, cracked corn, rye feeds, molasses feeds, alfalfa feeds, cotton-seed meal, gluten meal, poultry feeds, and special mixed and miscellaneous mixed feeds.

[Roborin stock feed], E. HAUPTMANN (*Tierärztl. Zeitschl., 36 (1913), No. 16, pp. 238-244*).—Roborin is a German stock feed claimed to be of medicinal and feeding value, and reported to have given favorable results in experiments with army horses. When fed to milch cows the milk and fat production were increased.

[Live stock in Alberta], E. L. RICHARDSON (*Ann. Rpt. Dept. Agr. Alberta, 1911, pp. 6-38, 242-272, pls. 2*).—This includes a statistical report of the live stock situation in Alberta together with data on pure-bred stallion enrollment and the horse and cattle importations to that State.

Animal husbandry, F. W. WILSON (*Arizona Sta. Rpt. 1912, pp. 685-691*).—The factors essential in obtaining high market prices for wool in Arizona are enumerated and discussed in connection with the sheep breeding studies. A lot of 1,700 lbs. of wool was found to lose 15 lbs. in storage but gained 6 lbs. in transit, probably due to the dry climate in Arizona and the humid condition in the Eastern market.

In swine feeding trials with milo maize, 4 lots of 4 pigs each fed approximately 11 weeks gave the following results: Lot 1, fed ground milo maize, chopped alfalfa, and rolled barley, made 233 lbs. gain; lot 2 on ground milo maize and alfalfa 180 lbs.; lot 3 on ground milo maize and wheat bran 240.5 lbs.; and lot 4 on whole milo maize 258.5 lbs. However, the waste was greatest with lot 4, viz, 238 lbs.; lot 1, 125.75 lbs.; lot 2, 199.25 lbs., and lot 3, 16.50 lbs.

Live stock experiments (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 13 (1913), No. 3, pp. 500-514).—In a feeding test to determine the value of potatoes as a pig feed, 2 lots of 33 pigs each were fed 114 days with the following results: Lot 1, fed potatoes in addition to corn meal, pollard, and skim milk made an average daily gain per head of 1.41 lbs., costing £1 8s. 2d. per 100 lbs. gain (5.15 cts. per pound). Lot 2, fed an extra quantity of corn meal, pollard, linseed cake, and skim milk made a corresponding gain of 1.42 lbs., at a cost of £1 6s. 7d. per 100 lbs. gain. It was concluded that in Ireland pigs can be fattened successfully without potatoes, and that it is doubtful whether it is economical to feed pigs on salable potatoes if they can be sold for one-fourth the value of meal.

In experiments comparing barley meal and maize meal as a feed for pigs, 2 lots of 37 three-month-old pigs were fed 92 days. The difference in gains made and the cost of gains was slight, although it was concluded that "maize is worth approximately 10 s. per ton more than barley meal for pig feeding. As regards the quality of the pork, barley meal seems to be slightly superior to maize meal."

In a test with 120 calves, comparing the relative value of oat meal and of wheat meal as a 2-part ingredient in a calf meal consisting of 1 part flaxseed meal and 2 parts maize meal, it was concluded that these two meal mixtures are of practically equal value. In cattle feeding trials, comparing home-grown and imported feeding stuffs, no material difference was realized either in gains made or in cost of gain.

[On the breeds of cattle] (*An. Soc. Rural Argentina*, 47 (1913), No. 2, pp. 124-132, figs. 8).—This treats of the conformation and breed characteristics of the cattle of Argentina.

The cattle of Muansa and Tabora Provinces, SCHAELE (*Pflanzer*, 9 (1913), No. 3, pp. 117-130).—This article treats of the anatomy, constitution, weight, body characteristics, dairy qualities, and management of the cattle of Muansa and Tabora Provinces, Dutch East Africa.

Controlling sex in calves, C. D. Woods (*New England Homestead*, 66 (1913), No. 25, p. 749).—Extensive investigations, carried on by the Maine Station to test the effectiveness of the theory that the period of heat is a determining factor as to the sex of animals, indicated that "the proportion of sexes change with the time of service." Of 558 distinct breeding operations tested, the following table shows the proportion of sexes for the several periods of service:

Relation of sex of offspring to the time of service.

Time of service.	Sex of calf.		Number of males to every 100 females.
	Male.	Female.	
Early in heat.....	134	178	75
Middle of heat.....	67	58	115
Late in heat.....	77	44	175
Totals.....	278	280	99

It is believed that these figures represent "a real and definite law of sex determination." However, "it is not contended or supposed that the time of service in relation to the period of heat absolutely controls the sex of the consequent offspring," but that "the sex ratio in cattle can be to some extent modified by controlling the time of service."

Domestic sheep and their wild ancestors.—I, **Sheep of the Mouflon and Urial types**, J. C. EWART (*Trans. Highland and Agr. Soc. Scot.*, 5. ser., 25 (1913), pp. 160–191, figs. 38).—In this paper the author discusses the origin of the 4 types of wild sheep, i. e., Mouflon, Urial, Argali, and Bighorn, and comments on the probable early union of the 2 former types as the origin of present breeds of domestic sheep. Included in the article are notes by J. H. Koeppern and H. Sanderson on the wools of primitive sheep, and soay and other wools.

Species of wild sheep and their distribution, R. KOWARZIK (*Zool. Anz.*, 41 (1913), No. 10, pp. 439–445).—This is a study of the species of wild sheep of Europe, America, and Asia with special reference to their geographical distribution.

The Corriedale [sheep], CAMDEN (*Pastoralists' Rev.*, 23 (1913), No. 4, pp. 351, 352, figs. 3).—This is a short article on the foundation, history, present status, and qualities of the Corriedale breed of sheep.

This breed first developed as the "result of an effort to establish the desirable characteristics of the first cross between a Longwool ram and a Merino ewe, and was the outcome of special requirements in certain parts of New Zealand." Probably the first efforts along this line were made in the fifties, at which time inbreeding was carried on among the first cross between Romney Marsh and Merinos. This flock ran for over 20 years and the results were considered to be very satisfactory.

In 1879 large-framed high-class Merino ewes were bred to the best Lincoln rams obtainable. By selection and further introduction of Lincoln-Merino blood the flock has been built up and now numbers over 10,000 breeding ewes. Other efforts were made with Border Leicester-Merino and with English Leicester-Merino crosses. The original efforts with the Romney-Merino Corriedale have been largely lost and now the Lincoln-Merino strain predominates. The Corriedale is now recognized as a distinct breed and experiments are under way on the Longwool and Merino cross.

It is said that "the Corriedales give high percentages of lambs, 120 per cent not being uncommon. The wool ranges from 50's to 60's in quality and sells up to 1s. 4½d. The best sheep cut about 10½ lbs. of wool and at about 2½ years old will weigh from 90 to 100 lbs. dressed."

The production of early mutton, A. MACNEILAGE (*Trans. Highland and Agr. Soc. Scot.*, 5. ser., 25 (1913), pp. 208–223).—Extensive inquiries made throughout Scotland with regard to the popular demand for mutton indicated that the current taste demands sheep from 10 to 14 months of age and weighing from 56 to 64 lbs. The foreign supply of mutton from Australia and New Zealand is discussed, and there follows an account of popular methods of mutton production, feeding of cross-breds, house feeding, the feeding of Blackfaces for early mutton, and similar items.

Sheep husbandry for Louisiana, W. H. DALRYMPLE (*Baton Rouge, La.*, 1913, pp. 56, figs. 33).—This publication is a general treatise on the advantages of sheep farming for the South, means of improvement, methods of care and management, and a discussion of the various types and breeds of sheep.

Dressing and skinning sheep (*Pastoralists' Rev.*, 23 (1913), No. 4, pp. 352, 353, figs. 4).—This is a detailed account of the method used in dressing and skinning sheep for shop and export trade.

The searing iron v. the knife for detailing lambs, J. W. MATHEWS ET AL. (*Dept. Agr. N. S. Wales, Farmers' Bul.* 67, pp. 34, figs. 7).—This is a compilation of articles and reports of experiments on the comparative results obtained from detailing lambs by the searing-iron and knife methods.

Results in general indicated that the 2 methods were of about equal value. Development of the lambs was apparently not checked, and the lambs that had been knifed showed no serious effects from the loss of blood. Somewhat greater trouble was experienced in getting the seared tails to heal than in the case of those knifed.

Inheritance of mammae in Duroc Jersey swine, E. N. WENTWORTH (*Amer. Nat.*, 47 (1913), No. 557, pp. 257-278, figs. 3).—A continuation of investigations previously noted (*E. S. R.*, 28, p. 574) in which 57 grade Duroc Jersey sows and 510 pigs were examined.

The author's conclusions are as follows:

"There are 2 common sorts of variations from the even paired type in the mammae of swine, aside from the simple addition and subtraction of pairs. These are the 'triangle' and 'suppressed' nipple variations. Each shows a definite tendency to reproduce itself in the offspring, but both are apparently associated with an increased number of pairs. The seat of the greatest variation in the animals under discussion is the second pair of mammae. This is perhaps due to the type of variation in the sires. There is apparently a breed difference in regard to the number of mammae. Bateson shows that in Tamworths and Berkshires, 13, 14, and 15 mammae are typical, occurring in 77 per cent of the cases. The Duroc Jerseys studied show in 90 per cent of the animals 10, 11, or 12 mammae.

"The ratio of asymmetrical to symmetrical patterns increases as the number of mammae increase. With 5 pairs symmetry is almost constant; with 6 pairs, symmetry and asymmetry are equal. With 7 pairs asymmetry outnumbers symmetry 2:1. No evidence definitely showed that asymmetry is unilateral in inheritance. Asymmetry on one side of the parent does not, on the average, produce asymmetry on the same side only of the offspring. Sows differing in number of mammae, when mated with the same boar, produce offspring variable in number of mammae. In general, sows with a large number of mammae produce more offspring of a corresponding sort than do sows with a small number of mammae. The difference, however, is not great, and neither sort apparently breeds true. The correlation of mother and offspring in number of mammae is measured by the coefficient 0.2626 ± 0.028 . There is a distinct inheritance of the tendency to produce a greater number of pairs, the correlation being 0.3588 ± 0.034 .

"There is no evidence of lateral inheritance of the mammae, the inheritance by pairs being a more probable hypothesis. No definitely Mendelizing units were found in the abdominal mammary series, but the relations between grandparents and offspring and parents and offspring do indicate a segregation of some sort. Rudimentaries in the functional mammary series have the same effect on the pattern as normal mammae, and probably represent lack of development. There is no greater tendency to variation among the rudimentary nipples of the male than among the potentially functional nipples of the female. The paired rudimentaries to the rear of the inguinal pair behave as a simple Mendelian unit character, sex limited in inheritance."

Swine feeding experiments with malt sprouts in comparison with skim milk, Institute of Proskau, 1912, KLEIN (*Mitt. Ver. Deut. Schweinezüchter*, 20 (1913), No. 12, pp. 242-248).—This is a report of feeding experiments with swine in which corn, barley, and potato flakes were fed in various proportions

as a basal ration, supplemented with dry and wet malt sprouts and with skim milk.

In the case of wet malt sprouts the average daily gain per head was 0.553 kg., costing 0.73 mark per kilogram as compared with 0.566 kg. and 0.76 mark for the pigs fed a supplemental feed of skim milk. The experiment in which dry malt sprouts were included showed an average daily gain per head of 0.673 kg., costing 0.76 mark per kilogram, as compared with 0.65 kg. and 0.82 mark on the skim milk ration.

There is included in this report analyses of these feeds and data as to the dry matter, digestible protein, and carbohydrate food requirements under the various conditions.

Pastures for hogs, F. G. KING (*Missouri Bd. Agr. Mo. Bul.*, 11 (1913), No. 4, pp. 5-39, figs. 6).—This is a popular bulletin dealing with the various kinds of pastures and forages for summer and fall hog feeding.

Pig insurance clubs in 1911 (*Jour. Bd. Agr. [London]*, 19 (1912), No. 8, pp. 679-691).—An account of the organization and management of the mutual clubs for the insurance of pigs in England and Wales.

[The cavalry horse], ALLEN, A. BELMONT, ROE ET AL. (*Proc. N. Y. Farmers*, 1912-13, pp. 5-26).—This is a discussion of means of improving the cavalry horse and of the work of the United States Department of Agriculture with the Morgan breed in Vermont and elsewhere.

Judging draught horses.—A Canadian opinion, R. B. SMITH (*Pastoralists' Rev.*, 23 (1913), No. 4, pp. 359, 360).—This is a detailed account of methods of procedure in judging draught horses and points of quality to be looked for.

Government certification of stallions, W. A. N. ROBERTSON (*Jour. Dept. Agr. Victoria*, 11 (1913), No. 5, pp. 257-287, figs. 2).—This includes a summary of the stallion certifications and rejections in the State of Victoria during the past 6 years. The number of cases and percentages of various hereditary unsoundnesses examined are noted.

Report of the poultry superintendent, A. W. FOLEY (*Ann. Rpt. Dept. Agr. Alberta*, 1911, pp. 164-175, figs. 5).—This is a report of experiments in housing poultry, in which various styles of houses with cotton and glass windows were used. Temperatures were taken during the months of December, January, February, and March. A house in which the wall was constructed of 2 thicknesses of timber with paper between and the windows made with the lower half of sash glass and the upper half of cotton, proved most satisfactory.

A detailed description of brooder house construction is also included.

Modern breeds of poultry, J. PETTIPHER (*Jour. Brit. Dairy Farmers' Assoc.*, 27 (1913), pp. 32-40, figs. 5).—This article deals with the breeding, history, and characteristics of the following breeds of poultry: Rhode Island Red, Brown Sussex, Orpington, Maline, Yokohama, Campine, Rosecomb Plymouth Rock, La Bresse, White Faverolle, Sumatra Game, Sicilian Buttercup, and Apteryx Langshan; and the Khaki-Campbell Buff and Blue Orpington, and Blue Forest ducks.

The presence of the barred plumage pattern in the White Leghorn breed of fowls, P. B. HADLEY (*Amer. Nat.*, 47 (1913), No. 559, pp. 418-428, figs. 6).—A critical study of the occurrence of the barred plumage pattern in the White Leghorns.

A White Leghorn male was crossed with a Black Hamburg female with resulting impure white birds in the first generation. In F_2 , however, the barred characteristic was plainly evident in a number of cases. The author assumes that the Black Hamburg does not possess an inhibition for barring, and hence concludes that the occurrence of the barred character in F_2 is due to the homo-

zygous factor for barring possessed by the White Leghorn male. A 3:1 ratio in a white and black cross was expected, but the actual results obtained were 90 white to 27 dark. The author attributes this slight discrepancy to the early death of some of the chicks, in which cases the barring character was not fully determined.

It is stated that "crosses involving the White Leghorn female have not yet been made, but it seems likely that these fowls are heterozygous for the barred character, which probably follows lines of inheritance similar to the barring of the Barred Plymouth Rock breed."

Breeding for egg production, M. PURVIS (*Breeder's Gaz.*, 63 (1913), No. 16, p. 949).—This is a comment on work by Pearl, previously reported (*E. S. R.*, 28, p. 576), laying especial emphasis on newly discovered facts with regard to fecundity in fowls. It is pointed out that high laying qualities are not inherited by daughters from their dams, but may be inherited from their sires independent of the dam.

Egg-laying competitions at the Hawkesbury Agricultural College [1912–13], D. S. THOMPSON (*Agr. Gaz. N. S. Wales*, 24 (1913), No. 5, pp. 417–430, pls. 3, figs. 2).—A résumé of the year's work in egg-laying competitions with various breeds of poultry and ducks.

Methods of fattening, dressing, and marketing poultry, R. V. MITCHELL (*Missouri Bd. Agr. Mo. Bul.*, 11 (1913), No. 2, pp. 4–32, figs. 22).—The author discusses the type, age, and weight of market birds and methods of feeding farm poultry for market purposes.

In feeding experiments with grain feeds it was concluded "that whole grain does not fatten chickens; that it is cheaper to feed the grain finely ground; and that the best gains can be had by feeding birds finely ground feeds when confined in crates." The construction of fattening crates is described and a profitable fattening ration proposed.

In feeding experiments with 3 different fattening rations composed of various amounts of corn meal, the gains made were in proportion to the amount of corn in the ration. The best returns resulted from a ration consisting of 24 parts white bolted corn meal, 6 parts low grade flour, and 1 part each of oatmeal, pea meal, buckwheat middlings, and wheat middlings. The flesh of the birds fed on this ration was creamy white in color, the fat was distributed over the body, and the entrails were encased with fat. Methods of killing, picking, cooling, and dressing are described.

How the produce dealer may improve the quality of poultry and eggs, H. C. PIERCE (*U. S. Dept. Agr. Yearbook 1912*, pp. 345–352, pl. 1).—In this general article it is contended that the greatest preventable loss occurs while these products are still on the farm or in the hands of the small country storekeeper, and it is suggested that the produce dealer is the one best fitted to aid in the improvement of quality. Buying on a quality basis is regarded as the most feasible plan and easily within the control of the local buyer.

The handling of dressed poultry a thousand miles from the market, M. E. PENNINGTON (*U. S. Dept. Agr. Yearbook 1912*, pp. 285–292, pls. 13).—This article treats of the preparation of poultry for killing, and methods of killing, picking, chilling, grading, packing, and shipping.

Raising guinea pigs, D. E. LANTZ (*U. S. Dept. Agr., Farmers' Bul.* 525, pp. 12, figs. 5).—This bulletin treats of the care and management of guinea pigs, with special reference to their production for scientific investigations and medical research. It is also stated that they are useful food animals.

DAIRY FARMING—DAIRYING.

Dairying and its relation to agriculture in semiarid sections, A. K. RISSE (U. S. Dept. Agr. Yearbook 1912, pp. 463-470, pls. 4).—This is a general discussion of the importance of diversified farming in the semiarid sections, with special attention to the profits accruing from dairy farming.

[Report of the dairy commissioner of North Dakota for the term ending June 30, 1912], R. F. FLINT (*Bien. Rpt. Comr. Agr. and Labor N. Dak.*, 12 (1911-12), pp. 175-255, pls. 5, figs. 7).—A general report of dairy conditions in North Dakota, with a discussion on the silo and on silage feeding for dairy cows.

Progress and prospects of dairying in Virginia, A. F. HOWARD (*Dept. Agr. and Immigr. Va., Dairy and Food Div. Bul.* 27, 1912, pp. 46, figs. 47).—A general bulletin dealing with dairying and creamery practice in Virginia.

The management of a dairy farm, J. DRYSDALE (*Trans. Highland and Agr. Soc. Scot.*, 5. ser., 25 (1913), pp. 58-78).—A general discussion of dairying methods in Ayrshire and other counties of Scotland.

Winter feeding of dairy cows, A. S. GRANT (*Trans. Highland and Agr. Soc. Scot.*, 5. ser., 25 (1913), pp. 1-58).—This is an extended account of methods of dairy management in Scotland, with special reference to the rations fed in the various sections.

Soiling and summer silage, H. O. DANIELS (*Mass. Bd. Agr. Rpt.* 1911, pp. 52-64).—The author relates personal experiences in the summer feeding of dairy stock on soiling crops and silage. A system of growing clover, rye, wheat, or oats and putting them into the silo to tide over the dry pasture period is recommended.

Relation between form and function in the milch cow, E. VAN DER VEEN-MÜLLER (*Mitt. Deut. Landw. Gesell.*, 28 (1913), No. 17, pp. 255-257).—This is a treatise on the correlation of body form to milk production in the dairy animal.

Relation between live weight and performance in the dairy cow, J. PETERS (*Deut. Landw. Tierzucht*, 17 (1913), No. 21, pp. 252, 253).—The author presents data obtained from studies of the herd book records of 1,938 cows, grouped as to live weight and showing the average milk yield and percentage of milk fat per group. There is an evident correlation between body weight and performance, the heavier cows (weights ranging from 500 to 650 kg.) giving the greater milk yields. However, the percentage of fat slightly favors the lighter animals.

Developing dairy Shorthorns, W. A. SIMPSON (*Breeder's Gaz.*, 63 (1913), No. 24, p. 1350).—The author discusses early and recent importations of dairy Shorthorns to America and shows wherein the development of this breed consists largely in the application of the principles of breeding and selection.

The production of sanitary milk by our present milk producers, C. E. NORTH (*Mass. Bd. Agr. Rpt.* 1911, pp. 65-91).—The author summarizes the essential requirements in the production of certified milk.

The milk supply of New York City, E. J. LEDERLE and R. RAYNOR (*Dept. Health N. Y. City, Monograph Ser.*, 1912, No. 5, pp. 92, pls. 18, figs. 5).—This report deals with the progress of milk inspection in New York City since 1904. The subjects of infant milk supply, infectious diseases of milk, methods of control, the grading of milk, and similar items are considered.

The financial stimulus in city milk production, H. A. HARDING and J. D. BREW (*New York State Sta. Bul.* 363, pp. 165-178, fig. 1).—This bulletin is a continuation of work previously referred to (*E. S. R.*, 25, p. 480) in which the authors discuss the importance of a financial stimulus to the production of clean milk. It is stated that "under the joint action of these 2 factors, publicity and payment based on quality, the sanitary conditions surrounding

the milk supply steadily improved until the report for March, 1911, showed that 12.8 per cent of the dairies ranked as 'excellent' and 87.2 per cent 'good.' The 'poor' grade had disappeared quickly before the light of publicity, and the 'medium' grade had decreased steadily and finally had disappeared." Considerable credit for this improvement in the milk supply is given to the efficiency of the dairy inspector who was operating at that time. However, it is pointed out that following this report there was a reaction due to a change in inspectors, with the result that inspections made by the authors in January and February, 1913, showed 18 per cent 'good' and 82 per cent "medium."

It is further explained that "every external form and legal enactment which accompanied one of the most striking recorded cases of municipal improvement of a milk supply is still in force, and yet within less than 2 years the sanitary conditions surrounding the milk production have returned essentially to the condition in which they were at the beginning of the original improvement."

The essential point lies in the fact that "during the latter part of 1912, when the official grading of the dairies merely retained them at the highest grade which they had previously reached, the financial stimulus for the production of cleaner milk was weakened if not entirely removed." Had the strict grading of dairies been continued and the effect of the financial stimulus been retained, it is thought probable that this marked deterioration in the quality of the milk supply would not have occurred.

The authors summarize their findings as follows: "Under present financial conditions the wholesale price of city milk is not high enough to yield the average owner of a dairy a satisfactory interest upon his investment; therefore he is compelled to supply the cheapest grade of milk that the market will accept without reducing the purchase price. The main opportunity for cheapening production is to omit the labor and care which are necessary to the production of a clean, sanitary article. The financial stimulus is the strongest force which can be enlisted in the improvement of municipal milk supplies. Milk supplies will never become better as long as the largest profit is attained by the production of dirty milk. However, they will improve when consumers are able to buy graded milk which they are sure is true to grade."

The price control factor in the pure milk problem, F. H. HALL (*New York State Sta. Bul.* 363, popular ed., pp. 8).—This is a popular edition of the above.

The pollution of the air in commercial dairy byres, J. HENDRICK (*Trans. Highland and Agr. Soc. Scot.*, 5. ser., 25 (1913), pp. 79-96).—This is an account of investigations supplementing former work (E. S. R., 21, p. 376) to determine the actual condition of the air in commercial milk-producing barns conducted under ordinary conditions. Tabular data are presented as to the air space per cow, floor space per cow, maximum, minimum, and average amount of carbon dioxid present in evening and morning air, average temperature of the barn, and details of ventilation of the 18 barns tested.

Character of water for the creamery, DAIRE (*Indus. Lait.* [Paris], 38 (1913), Nos. 17, pp. 274-279; 18, pp. 289-295).—A discussion of the chemical and bacteriological character of water used in the creamery, with special attention to the sources of contamination. Water often contains a high percentage of calcium and iron, rendering it detrimental to use in the dairy. The author discusses the purification of water by means of filtration and electrical sterilization. The use of phosphoric acid as a sterilizing agent is also suggested.

Composition of first-drawn and last-drawn milk, D. A. GILCHRIST (*Jour. Bd. Agr.* [London], 20 (1913), No. 2, pp. 97-106, fig. 1).—An account of studies

on the composition of first-drawn and last-drawn milk, in which it was found that "considerably the largest yield was given in the morning after the longest interval between the milkings." The first pint drawn from each cow contained on the average 1.26 per cent of fat at 5 a. m., 2.16 per cent at 12.30 noon, and 3.57 per cent at 6.30 p. m. as compared with average percentages of fat in the strippings of 6.03, 6.56, and 5.59 per cent, respectively.

Data on the variations in the composition of milk during the process of milking are included. It was estimated that the solids-not-fat were not less in the first-drawn milk, nor did they increase in the last-drawn milk.

Contribution on the different forms of lactic ferment, C. GORINI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 21 (1912), II, No. 11, pp. 790-796).—In this article the author reviews the findings of previous investigations of forms of the lactic ferment and gives brief descriptions of various bacteria found.

The butter tests for 1912, R. H. EVANS (*Jour. Brit. Dairy Farmers' Assoc.*, 27 (1913), pp. 139-158).—The average butter ratio of 54 cows during a 62-day milking period was 1:25.82, and the average yield of butter per 24 hours milking period was 1 lb. 14½ oz. There are appended tables showing the number of cattle of the various breeds tested since 1895 with their average period of lactation, weight of butter, butter ratios, and scores; also the average yield of butter of the different breeds at different periods, and comparisons of churnings and of analyses for the different breeds.

[Feeding potatoes for cheese production], J. C. LOOMIS (*Pacific Rural Press*, 85 (1913), No. 21, p. 597).—This article reviews the work of a California dairyman in feeding raw potatoes to dairy cows for cheese production. The potatoes supplanted silage and a portion of the alfalfa hay allowance.

It is stated that in feeding 288 cows for a period of over 3 months the yield of cheese was nearly doubled. The estimated saving of feed on the potato ration was \$38 per day and the increased yield of cheese \$56, making a total net gain of \$94 daily in favor of the potato feed. Furthermore, the cattle increased in weight and condition. Attention is called to the danger of bloating on the potato ration.

The manufacture of Cheddar cheese, AGROSTIS (*Mark Lane Express*, 109 (1913), No. 4265, pp. 889, 891, figs. 3).—This is a general article dealing with the usual method employed in the dairies of Somersetshire, England.

The manufacture of cheese of the Cheddar type from pasteurized milk, J. L. SAMMIS and A. T. BRUHN (*U. S. Dept. Agr., Bur. Anim. Indus. Bul.* 165, pp. 95, pls. 6, figs. 6).—This embodies the cooperative work at the Wisconsin Station previously reported (*E. S. R.*, 28, p. 581).

Tätté, the fermented milk of Scandinavia, W. FREUND (*Molk. Ztg. [Hildesheim]*, 27 (1913), No. 34, pp. 661, 662).—This subject has been previously referred to (*E. S. R.*, 27, p. 880). The author discusses the dietetic value of this food and compares it with yoghourt as a food for convalescents.

Intoxicating alcohol of milk, C. GROUD (*Indus. Lait. [Paris]*, 38 (1913), No. 22, pp. 349-351).—A short article on the preparation of milk champagne, better known as "kéfir," and composed of sugar 10 gm., milk 1 liter, and yeast 4 gm. Fermentation takes place in 24 hours at a temperature of from 14 to 15° C.

Manufacture of milk powder from various preserved milks, HITTCHER (*Molk. Ztg. [Hildesheim]*, 27 (1913), No. 35, pp. 675, 676).—In this article the author discusses the general advantages of the commercial product, milk powder, and compares the German and American methods of manufacture. It is estimated that 1 kg. of powder may be produced from 8 liters of whole milk or 11 liters of skim milk.

Condensed and desiccated milk, L. WELLS (*U. S. Dept. Agr. Yearbook 1912*, pp. 335-344).—The author discusses the economic importance of condensed and dessicated milk and describes the various processes of manufacture.

Dry milk preparation, H. KÜHL (*Hyg. Rundschau*, 23 (1913), No. 12, pp. 709-713).—This includes analyses of powders made from cream, whole milk, skim milk, and separator milk.

VETERINARY MEDICINE.

A system of veterinary medicine, edited by E. W. HOARE (*Chicago, 1913*, vol. 1, pp. XVI+1327).—This work, prepared by the editor in collaboration with various British veterinarians, is intended for the use of both practitioners and students. In the preparation of the present volume, which deals with the microbial diseases, no less than 25 veterinarians have contributed articles.

The animal doctor, H. LEENEY (*New York, 1913*, pp. XIV+489, pls. 5, figs. 58).—A semipopular work.

Second report of the director of veterinary research (*Rpt. Dir. Vet. Research Union, So. Africa, 2 (1912)*, pp. 483, pls. 54, figs. 9).—This second report (E. S. R., 26, p. 882) consists of 14 separate papers by various authors. The subjects dealt with are as follows: Facts and Theories about Stijfziekte and Lamziekte, by A. Theiler (pp. 7-78) (E. S. R., 28, p. 780); Investigations into the Disease Lamziekte in Cattle, by J. Walker (pp. 79-160); Lamziekte, by D. T. Mitchell (pp. 161-180); Botanical Investigations into Gal-lamziekte, by J. Burt-Davy (pp. 181-221) (E. S. R., 28, p. 280); Notes on Some of the Symptoms Produced in Healthy Cattle by the Use of Certain Alkaloids, by D. Kehoe (pp. 222-265); The Immunization of Cattle Against East Coast Fever, by A. Theiler (pp. 266-314); Second Report on the Mosquitoes of the Transval, by F. V. Theobald (pp. 315-342); A Tick New to South Africa (*Ornithodoros megnini*), by G. A. H. Bedford (pp. 343, 344); Notes on Zululand Trypanosomes, by A. W. Shilston (pp. 345-361); Some Experiments on the Drug Treatment of Trypanosomiasis, by W. H. Andrews (pp. 362-383); A Short Note on the Occurrence of a Leucocytozoon Infection: Host, The Ostrich, by J. Walker (pp. 384-386) (E. S. R., 28, p. 683); Preliminary Note on the Poisonous Properties of *Cotyledon orbiculata*, by D. Kehoe (pp. 387-397); Report on Some Experiments in Connection with the Life History of *Strongylus* (or *Haemonchus*) *contortus*, the Wireworm of Sheep and Goats, and Also Some Notes on the Zoological Structure of the Wireworm and of the Nodular Worm, *Esophagostomum columbianum*, by R. C. Lewis (pp. 398-405); and Experiments with Snakes, by W. H. Andrews (pp. 406-483).

The weight of the lungs of mammals, A. MAGNAN (*Compt. Rend. Soc. Biol. [Paris]*, 73 (1912), No. 37, pp. 690-692).—A report of studies of 29 species.

The nonoperative methods of treating malignant growths, R. WERNER (*Berlin. Klin. Wehnschr.*, 50 (1913), No. 10, pp. 435-441).—This deals with the various forms of nonoperative procedures, i. e., serum antisubstances, X-rays, and chemotherapy against tumors. Especial stress is laid on the rays and cholin treatments.

Biological method for diagnosing pregnancy, E. FRANK and F. HEIMANN (*Berlin. Klin. Wehnschr.*, 49 (1912), No. 36, pp. 1706-1708; *abs. in Berlin. Tierärztl. Wehnschr.*, 29 (1913), No. 16, pp. 292, 293).—The dialysis method is considered an excellent one for diagnosing pregnancy. Extraordinary precaution, however, must be taken to see that the dialyzing membrane does not allow unchanged proteins to pass through.

The use of the antitryptic power of blood serum for diagnostic purposes, M. BERRAR and E. RAITSITS (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 9, pp. 154-158).—After reviewing the work done in regard to the antitryptic power of blood serum under normal and pathologic conditions in man and animals, the authors consider its use as a diagnostic agent, especially for diagnosing pregnancy, as the reaction had not been used for domesticated animals.

It is shown that with normal animals such as horses, white mice, bovines, dogs, cats, and rabbits, a lower antitryptic index (from 0.6 to 0.8) is obtained than with man. No relation was found between the body temperature and the antitryptic index. The index was not affected by the sex of the animal or by the process of blood letting.

Chronic diseases, especially those in which pus is present, and tuberculosis often show an increase in antitryptic power of the blood serum. No increase was noted in acute infectious diseases. In pregnant herbivorous animals a strong antitryptic index was never noted. In 2 dogs it was somewhat higher than the normal. In gravid tuberculous cows the reaction is often very marked, but, on the other hand, a marked antitryptic index may be present in the sound nongravid animals. Normal values are also observed in both cases, consequently it is concluded that the antitryptic activity of the blood serum can not be relied upon for diagnosing disease or pregnancy in animals.

Primary serum toxicity, R. DOERR and F. WEINFURTER (*Centbl. Bakt. [etc.]*, 1. Abt., *Orig.*, 67 (1912), No. 1-2, pp. 92-100).—By repeated blood letting at short intervals, the primary toxicity produced by rabbit serum in guinea pigs can be increased threefold and more. After attaining a maximum toxicity, however, it decreases even if the withdrawing of blood is continued. Injection of Witte's peptone or colloidal silicic acid increases the serum toxicity of rabbits for a short time only. Starvation does not increase the toxicity.

Studies on cotton-seed meal toxicity.—II, Iron as an antidote, W. A. WITHERS, J. F. BREWSTER, ET AL. (*Jour. Biol. Chem.*, 15 (1913), No. 1, pp. 161-166).—In the course of experiments continuing work previously noted (E. S. R., 29, p. 76), the authors were led to the hypothesis that the toxic principle of cotton-seed meal was a constituent group of the protein molecule containing loosely bound sulphur which exerted its toxic effect upon the iron of the blood. Experiments already performed as bearing on this hypothesis will be published in a later paper, and the present paper deals principally with the efficiency of iron as an antidote for cotton-seed meal poisoning. The iron was fed in the form of citrate of iron and ammonia.

Comparing the results obtained with the feed, it was found "that the iron-fed rabbits consumed nearly 5 times the amount of meal which proved fatal to the average rabbit without iron, and more than twice as much as the greatest amount of meal necessary to kill the rabbit which ate the most meal; that the iron-fed rabbits have survived more than 3 times as long as the average rabbit without iron, and nearly twice as long as the hardest rabbit; that every rabbit fed iron and meal gained in weight and each rabbit fed meal without iron lost in weight."

Each of the 22 rabbits receiving cotton-seed meal without iron died (average, 13 days), while each of the 11 rabbits taking iron with cotton-seed meal survived.

Experiments are in progress with hogs and the results will be reported later.

Examination of milk from newly lactating animals for its enzym content and the use of the enzym method for controlling the milk supply and in veterinary medicine, E. GRUBER (*Untersuchungen über den Enzymgehalt der Milch frischmilchender Kühe und die Verwendbarkeit der Enzymmethode in der Milchkontrolle und der tierärztlichen Praxis. Inaug. Diss., Tierärztl. Hochsch.*,

Stuttgart, 1912, pp. 61; rev. in Deut. Schlacht u. Viehhof Ztg., 12 (1912), No. 19, pp. 287, 288).—The milks from newly lactating animals nearly always contain oxidase and peroxidase. Both were present 30 hours after calving, the initial milk possessing the greatest activity and varying very much amongst the individual animals. Reductase (Schardinger's enzym) was found only in traces in the colostrum, but in the residual milk or strippings it was greater than in the initial milk. The catalytic activity was greatest in the milk of newly lactating animals, but the initial milk was less active than the strippings. In the first 8 or 10 hours after sampling it was found that the catalytic activity becomes slightly less, only to rise again to a greater point than was originally present, due to bacterial contamination. The diastatic power of the milk of freshly lactating animals was also found to be increased, but after the first week it goes down to what may be considered a normal point.

Anaplasms or Jolly bodies? A contribution to the knowledge of certain intracorpuseular bodies present in the blood of some species of mammals, S. DODD (*Jour. Compar. Path. and Ther., 26 (1913), No. 2, pp. 97-110, figs. 6*).—"The evidence at present appears to be greatly in favor of the view that the chromatin bodies observed in the erythrocytes of marsupials, lemurs, mouse deer, Capuchin monkey, and orang-outang at least are not protozoa, and therefore can not be classified with the anaplasms, but that they are more probably identical with the bodies of Jolly."

Photomicrographs of spirochetæ, entamebae, plasmodia, trypanosomes, Leishmania, Negri bodies, and parasitic helminths (*War Dept. [U. S.], Off Surg. Gen. Bul. 1, 1913, pp. 46, pls. 17*).—This work, intended for use in the study and identification of parasites, describes the methods used in the preparation of the specimens illustrated.

Encephalic embolic strongylosis or encranial strongylogenic embolism, J. LAW (*Vet. Jour., 69 (1913), No. 457, pp. 301-308*).—A discussion of the paper previously noted (*E. S. R., 28, p. 887*).

Studies of the bacillus of Schmorl.—III, Experiments on the rabbit, E. CÉSARI (*Ann. Inst. Pasteur, 27 (1913), No. 3, pp. 230-245*).—This third memoir (*E. S. R., 28, p. 676*) deals with subcutaneous, intravenous, and intraperitoneal injections of the necrosis bacillus.

Clarifying open questions with reference to anthrax and combating the same, W. BUROW (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 11 (1912), Nos. 1, pp. 15-42, figs. 3; 2, pp. 97-124; 3-4, pp. 226-254; abs. in Berlin. Tierärztl. Wchnschr., 29 (1913) No. 13, pp. 239, 240*).—The reason that anthrax occurs most frequently among domesticated animals during the warmer seasons is because the *Bacillus anthracis*, when present in the soil at this time, can develop under more favorable conditions. The various forms of the disease, namely, peracute, acute, and subacute, are due principally to the differences in susceptibility and the spontaneous immunity which some of the animals have attained. The disease is more frequent and more severe in sheep than in horses and bovines.

Fattened and other obese animals succumb to the infection much easier because they are comparatively anemic and are less active. Grade animals are less susceptible than pure bred, and draft oxen are more susceptible than nonworking animals. This last point must be taken into consideration when the animals receive protective vaccination in order to avoid losses resulting from vaccination.

The milk from vaccinated animals can be used for human consumption. The cause of death with animals affected with anthrax is an inhibition of the oxidizing function of the tissue cells.

The etiology of recurrent fever; its mode of transmission by the louse, C. NICOLLE, L. BLAIZOT, and E. CONSEIL (*Ann. Inst. Pasteur*, 27 (1913), No. 3, pp. 205-225, figs. 2).—The authors have been unable to transmit recurrent fever to man or monkeys through the bite of the louse, 6,515 louse bites proving harmless in this respect. The spirilla apparently disappear from the louse after a time only to reappear 8 days later and persist in the body of the louse for about 12 days, when they permanently disappear. The infection of the louse may be transmitted to the young, and this is probably responsible for the conservation of the virus. The germs in the louse do not invade the buccal cavity or digestive tract and thus have no communication with the exterior so long as the louse is alive and they die when the louse dies.

Man and monkeys, however, become inoculated with the disease through crushing the louse on the skin, the spirilla gaining entrance to the system through openings in the skin caused by scratching or by way of the conjunctiva, the head louse and body louse acting alike in this respect. *Ornithodoros savignyi* was found to be incapable of inoculating a monkey with the Tunis virus.

Trypanosomes v. heat center and anaphylatoxin fever in rabbits, R. HIRSCH (*Ztschr. Expt. Path. u. Ther.*, 13 (1913), No. 1, pp. 132-141).—The fever produced in rabbits by infection with trypanosomes results in a greater output of heat than that brought about by puncturing the heat center (the front end of the caudate nucleus) of the brain. On the other hand, that produced by anaphylatoxin results in a lower output than is present under normal conditions.

Trypanosoma equiperdum in Russia in Europe, A. W. BELITZER, NINA KOHL-YAKIMOFF, and W. L. YAKIMOFF (*Bul. Soc. Path. Exot.*, 5 (1912), No. 10, pp. 822-825).—A discussion of the occurrence of dourine.

Experimental observations in regard to the virulence of old (inactive) tuberculous foci in bovines, B. UHLENBRÖK (*Experimentelle Untersuchungen über die Virulenz alter (inaktiver) tuberkulöser Herde beim Rind. Inaug. Diss., Univ. Bern*, 1910, pp. 31; *abs. in Internat. Centbl. Gesam. Tuberkulose Forsch.*, 7 (1912), No. 2, p. 79).—With the aid of animal experimentation it is shown that old calcified glands of bovines contain virulent tubercle bacilli. The virulence of the organisms is, however, attenuated, and they show evidence of degeneration. In the experimental animals no marasmus or deaths occurred up to 112 days. The distribution of the lesions in guinea pigs was not extensive, and no caseation was noted.

The significance of bovine tubercle bacilli for man, J. ORTH (*Berlin. Klin. Wchnschr.*, 50 (1913), No. 10, pp. 429-435, figs. 2).—This deals with the significance of bovine tubercle bacilli for the occurrence of tuberculosis in man. It is concluded that the measures to be taken against the disease should not be left to veterinarians and animal husbandmen alone. The discussion is supported by statistical data.

Tubercular birds as a cause of tuberculosis in pigs, O. BANG (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 13 (1913), No. 5, pp. 215-225).—This details cases of tuberculosis in hogs which originated from fowls, and includes feeding and bacteriological tests. In one barn containing 45 animals, 30 were found to be affected with either mesenteric or cervical tuberculosis. After destroying the fowls, the disease was apparently eradicated. See also a previous note by De Jong (*E. S. R.*, 26, p. 583).

Contribution to the symptomatology of tuberculosis in the horse, M. AUGUSTIN (*Rev. Gén. Méd. Vét.*, 20 (1912), No. 233-234, pp. 261-264; *abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 10, pp. 186, 187).—A description of

a case in a 5-year-old cavalry mare in which the disease was not recognized for a long time, but was finally detected by a tuberculin injection and the ophthalmo reaction. The symptoms, which were unusual, are described in detail.

About the detection of tubercle bacilli in the circulating blood, and the practical significance of the same, H. MAMMEN (*Ueber den Nachweis von Tuberkelbacillen im strömenden Blute und seine praktische Bedeutung. Inaug. Diss., Univ. Giessen, 1911, pp. 34; abs. in Hyg. Rundschau, 22 (1912), No. 16, p. 1041*).—Among 15 cases (6 cows, 6 oxen, a horse, a calf, and a guinea pig) the tubercle bacillus was noted 12 times in the circulating blood. This was not only in cases of advanced tuberculosis but also in instances where the disease was hardly clinically noticeable; consequently, it is believed that the value of detecting the presence of tubercle bacilli in the blood must not be underestimated. The combined antiformin-ligroin method is preferred for this purpose.

Investigations in regard to the value of the alcohol test for detecting the milk of diseased animals, K. METZGER (*Untersuchungen über die Alkoholprobe bei Milch von kranken Kühen. Inaug. Diss., Univ. Stuttgart, 1912; abs. in Milchw. Zentbl., 42 (1913), No. 1, pp. 15, 16*).—The value of the alcohol test was studied in connection with the acidity of milk coming from 18 cases of tuberculosis, 26 cases of indigestion, 17 cases in which the genital organs were affected, and 9 cases of miscellaneous diseases.

The results obtained varied, consequently the test is not deemed one which can be relied upon for general diagnostic purposes. An exception, however, is supposed to be made in diagnosing impending abortion. A negative finding in these cases points with certainty to the fact that abortion will not take place within a certain time.

About the action of tuberculin on the nontubercular guinea pig, and the course of tuberculosis in the guinea pig pretreated with tuberculin, F. KLOPSTOCK (*Ztschr. Expt. Path. u. Ther., 13 (1913), No. 1, pp. 56-71*).—Repeated injections with old tuberculin in an initial dose of from 0.1 to 5 cc. and up to a dose of 26 cc. for the entire period, with intervals between injections of from $\frac{1}{2}$ to 4 weeks, produced no appreciable reaction in 15 out of 21 guinea pigs. In the remaining animals it was lethal. Three of the dead animals had a slight intestinal catarrh and showed a strong injection of the serosa of the lower intestine. Two other animals died as a result of peritonitis.

Pretreating animals with tuberculin for months did not seem to increase their resistance to an experimental infection with the tubercle bacillus. The hypersusceptibility toward tuberculin injections is, however, reduced, as 4 out of 6 animals at the height of tuberculosis were able to withstand the effects of 1 cc. of old tuberculin. Repeated injections of tuberculin into sound guinea pigs did not stimulate the formation of antibodies. Animals pretreated with tuberculin and then rendered tuberculous did not show antibody formation, as was evidenced by the complement fixation test.

Investigations in regard to vaccinations against bovine tuberculosis with laboratory animals (rabbits, guinea pigs), BRUSCHETTINI (*Centbl. Bakt. [etc.], 1. Abt., Orig., 68 (1913), No. 3-4, pp. 337-342*).—Comparative tests were made on a number of rabbits and guinea pigs with the following vaccines: (a) Tubercle bacilli grown on glycerin-bovine bile-potato; (b) bacilli with the fat extracted; (c) bacilli treated with an alkaline menstrum at 60° C.; (d) bacilli extracted with fat solvents in the cold and then treated at 60° with an alkaline solution; (e) bacilli treated with chloroform at 40° and then in vivo with leucocytes (according to the author's method).

The author's method consists of rubbing the virulent bacilli, which are grown on potato, with quartz powder and chloroform. The mixture is filtered through cotton previously saturated with chloroform, and kept in a water bath at 40° for from 12 to 18 hours; during this period the chloroform is changed 2 or 3 times. The bacilli are then collected on a filter (many bacilli are necessary for this process), quickly dried, made into a sodium chlorid suspension, and injected into the abdominal cavity of a rabbit which has been previously injected with aleuronat or Mellin's Food. After 12 hours another injection of aleuronat or Mellin's Food is given. Twelve hours following the last injection the animal is killed and the exudate in the abdominal cavity is drawn aseptically and rubbed for a long time with quartz powder and twice its volume of sodium chlorid solution. A few drops of chloroform are then added and the fluid kept for 24 hours at 37°, after which it is centrifuged and the fluid thus obtained is tested for sterility in doses of 1 cc. per kilogram of body weight (given subcutaneously).

In most of the vaccinations the subcutaneous and intravenous methods were used. A few intradermal tests such as recommended by Maragliano for man were tried but with negative results. From the tests it could be noted that the agglutinating, precipitating, etc., substances contained in the blood of the vaccinated animals were not very much higher than in those animals artificially infected with virulent tubercle bacilli. The best results were obtained with animals vaccinated according to methods (a) and (e) mentioned above. When vaccinated according to method (e), rapid absorption of vaccines takes place, and when given subcutaneously no local reaction occurs. None of the animals treated by the method became tubercular.

Immunization against tuberculosis, A. N. BORISSJAK, N. O. SIEBER, and G. J. METALNIKOW (*Ztschr. Immunitätsf. u. Expt. Ther.*, 1, Orig., 12 (1911), No. 1, pp. 65-84).—It is concluded that the best antigen for the production of antibodies is the wax of tubercle bacilli. Other effective substances are fat-free bacilli and lecithin used alone or together or in admixture with other substances. Tuberculin will not cause the production of antibodies, and when injected together with the wax from tubercle bacilli or fat-free bacilli the production will be decreased.

Antibodies obtained by immunizing with tubercle wax and fat-free bacilli act not only against these antigens but also against dead and living bacilli. Immunizing with commercial lecithin produces antibodies for tubercle bacilli and the wax and for fat-free tubercle bacilli, but not for the lecithin itself. Antibodies are also obtained by feeding tubercle bacilli or tubercle wax to guinea pigs.

Some further experiences with chemotherapy in tuberculosis, LINDEN (*Abh. in Internat. Centbl. Gesam. Tuberkulose Forsch.*, 7 (1912), No. 1, p. 47).—In collaboration with Finkler, tests were conducted with the salts of hydriodic and hydrochloric acids, methylene blue, copper chlorid, and a copper-lecithin compound against tuberculosis in guinea pigs.

The life of all the animals seemed to be prolonged, and in the animals treated with copper preparations, marked healing of the tubercular foci was noted. In 2 cases the tubercle bacilli were apparently all destroyed within the animal body, since when these animals were fed with pieces of lung or lymphatic glands, the disease was not reestablished.

Researches regarding epizootic abortion of cattle, J. M'FADYEAN, A. L. SHEATHER, and F. C. MINETT (*Jour. Compar. Path. and Ther.*, 26 (1913), No. 2, pp. 142-170, figs. 12).—The authors' conclusions are as follows:

"Cattle of any age and either sex may be infected by natural channels with the bacillus of epizootic abortion. Male animals (bulls and steers) can be infected by way of the prepuce.

"The agglutination and complement tests when applied to the serum of animals experimentally infected yield results that are broadly concordant. Either of these tests may give positive results within from 7 to 21 days after infection. In animals in which the result of the agglutination test is negative 3 weeks after the attempt to infect, it generally remains negative, and indicates that the animal has not become infected."

Myiasis in cattle in West Africa caused by *Chrysomya* (*Pycnosoma*) *megacephala*, G. BOUET and E. ROUBAUD (*Bul. Soc. Path. Exot.*, 5 (1912), No. 9, pp. 737-739; *abs. in Trop. Vet. Bul.*, 1 (1913), No. 3, pp. 182, 183).—A report of a case of myiasis in a cow caused by this dipteran, a species which appears to be widely distributed in Africa.

[Paralysis of lambs apparently caused by *Dermacentor venustus*], F. TORRANCE (*Amer. Vet. Rev.*, 43 (1913), No. 3, pp. 311, 312).—Studies by S. Hadwen of the paralysis of sheep and especially of lambs, which has caused losses from time to time in British Columbia, indicate that *D. venustus* may be a causative agent. A lamb to which these ticks were experimentally attached along the spine showed signs of lack of coordination on the sixth day and a total loss of coordination on the seventh, which condition progressed until on the tenth day the lamb was paralyzed.

The occurrence and forms of *Piroplasma ovis* in Dalmatia, H. INCHIOSTRI (*Osterr. Wchnschr. Tierheilk.*, 37 (1912), Nos. 29, pp. 289-292; 30, pp. 299-302; 31, pp. 310-313; 32, pp. 320-322; 33, pp. 331, 332; 34, pp. 340-343; *abs. in Trop. Vet. Bul.*, 1 (1912), No. 1, pp. 7-9; *Rev. Gén. Méd. Vét.*, 21 (1913), No. 242, pp. 68-71).—The author describes peracute, acute, ephemeral or abortive, chronic, and latent forms of ovine piroplasmosis which occur in the vicinity of Zara. *Rhipicephalus bursa* is said to be the tick that occurs on sheep in this district.

Epizootic of hog cholera (with the presence of *Salmonella*) at Algiers. Experimental transmission by the filterable virus, E. SERGENT, A. LHÉRITIER, A. BOQUET, and P. DENARNAUD (*Bul. Soc. Path. Exot.*, 5 (1912), No. 10, pp. 781-784).—A report of studies made during an outbreak of hog cholera at Algiers.

The relation which the *Bacillus voldagen* has to hog cholera, W. PFEILER and A. KOHLSTOCK (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 12, pp. 209-211).—A criticism of Haendel and Gildemeister's findings (*E. S. R.*, 28, p. 183). See also other notes (*E. S. R.*, 24, p. 390; 26, p. 785; 28, p. 183).

Method of using antihog cholera serum, D. E. BAUGHMAN (*Amer. Vet. Rev.*, 43 (1913), No. 2, pp. 145-150).—This details a number of cardinal principles to be observed when vaccinating against cholera in hogs.

The viability of certain cysticeri in pigs and in young dogs, J. W. SCOTT (*Science, n. ser.*, 37 (1913), No. 946, p. 263).—In experiments conducted by the author to determine whether hogs are injured by feeding upon rabbits infested with cysticeri of *Tinea serrata* and *T. serialis*, negative results were obtained in that no tapeworms were found when the hogs were slaughtered 10 days later. It is stated that when corn is scarce it is a common practice for farmers in western Kansas to feed hogs on jack rabbits in place of corn.

When the cysticeri were fed to young dogs from 90 to 100 per cent were recovered as young tapeworms.

Protective vaccination against the pectoral form of equine influenza, GÖRLITZ (*Abs. in Berlin. Tierärztl. Wchnschr.*, 28 (1912), No. 52, pp. 986, 987).—Pfeiler's method, which consists of the intravenous injection of serum and vaccine, was used. Diseased animals received 100 cc. of serum as curative treat-

ment, and those to be given protection received 50 cc. of vaccine and 100 cc. of the serum.

The method was applied in 3 barns, the first containing 20 horses, of which 1 was dead, another died 1 day after treatment, and 5 were strongly diseased; and the second contained 48 horses, of which 1 died, 5 were diseased, and 2 had a slight fever. The third consisted of 2 stables holding 40 animals each, in 1 of which 2 animals were dead and 4 were diseased, while in the other the animals were sound and received no treatment. In the first barn 12 animals given protective vaccination did not take the disease; in the second, 38 remained sound; and in the third, 34 were sound and 4 of those diseased recovered. Of the 40 control animals, i. e., those receiving no vaccination, only one showed a slight febrile condition, and this after a few weeks. No complications followed the treatment. The method is thought to be a good one for protective vaccination purposes.

Protective and curative tests in the pectoral form of equine influenza, K. NOWACKI (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 13, pp. 233-236).—A description of outbreaks in 2 barns, one containing 58 horses of which 18 had more or less marked symptoms of equine influenza; the other barn contained 48 horses, 5 of which had marked symptoms of the disease. Three of the animals died previous to treatment.

The 40 apparently sound horses in the first barn received 100 cc. of Pfeiler's serum and 50 cc. of vaccine given intravenously. Directly after vaccination no untoward effects were noted, but after one-half hour the horses became restless, perspired, developed tremors, and some discharged feces. After 2 hours most of the horses were down and refused to take feed. The lack of appetite persisted on an average for 48 hours, and during this time the horses could not be worked. The temperature rose from 0.5 to 0.8° C. above the normal. One of the horses died on the third day after giving the vaccine, but as a result of colic and tympanites; no pneumonia was found on section. In addition, seven 4-year-old foals were treated. Only 2 of the animals given protective treatment became affected with influenza, and these recovered. Of the 18 horses affected with influenza and given curative treatment 5 died.

The second group of animals was treated in the same manner, the diseased horses receiving only serum and those apparently unaffected, vaccine plus serum. Four days after vaccination 5 more cases developed among the apparently sound animals, but none of the 40 animals treated protectively died, while 1 of the 5 given curative treatment succumbed.

The author believes that the serum-vaccine treatment is a valuable method for immunizing animals against this disease.

Equine piroplasmosis in the Canal Zone, S. T. DARLING (*Science, n. ser.*, 37 (1913), No. 949, pp. 370, 371).—The author reports the occurrence of this disease in an American driving horse which had been on the Isthmus for several years. This animal is thought to have become infected from *Dermacentor nitens* while driven out into Las Sabanas to the Juan Diaz River. The parasite closely resembles *Piroplasma caballi* and differs from *Nuttallia equi* in not displaying "cross forms." See also a previous note (E. S. R., 29, p. 83).

Infection of the dog with piroplasmosis through the mucous membranes, N. N. NAVROTZKY (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 66 (1912), No. 5-6, pp. 417-420; *abs. in Trop. Vet. Bul.*, 1 (1913), No. 3, p. 140).—All of the 3 full-grown dogs and 5 puppies to which diluted blood containing piroplasms was introduced (1) by ingestion, and (2) directly into the stomach by means of a tube, became infected. All of the puppies and one of the dogs succumbed to the disease.

Toxoplasma canis, W. L. YAKIMOFF and NINA KOHL-YAKIMOFF (*Arch. Protistenk.*, 27 (1912), No. 2, pp. 195-206, pls. 2; *abs. in Trop. Vet. Bul.*, 1 (1913), No. 3, pp. 175-177).—A report of studies of this parasite, including experimental inoculations.

The parasites of the muskrat, F. D. BARKER (*Science*, n. ser., 37 (1913), No. 946, p. 268).—An examination of 27 muskrats trapped along the Loup River, Nebraska, resulted in the finding of more than 600 parasites, representing 7 species of trematodes, 1 species of cestode, and 2 species of nematodes. See also a previous note (*E. S. R.*, 27, p. 52).

The effects of commercial compounds of iodine in spirochetosis of fowls, T. MESSERSCHMIDT (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 15 (1912), No. 2-3, pp. 293-302).—Sodium sozoiodolate was the only one of the preparations employed by the author which had a beneficial effect.

RURAL ENGINEERING.

Agricultural engineering, J. B. DAVIDSON (*St. Paul, Minn.*, 1913, pp. 554, figs. 343).—This book is a comprehensive treatise of the subject, in which its various branches are discussed under the following heads: Agricultural surveying, drainage, irrigation, roads, farm machinery, farm motors, farm structures, farm sanitation, and rope work.

Irrigation investigations, G. E. P. SMITH and F. C. KELTON (*Arizona Sta. Rpt.* 1912, pp. 707-714, fig. 1).—The investigations in Sulphur Spring Valley indicate that with an average rainfall, such as occurred during the last 3 years, supplementary irrigation is required to produce profitable dry farm crops. This can be accomplished by storing storm waters or by pumping from wells, and irrigation for intensive farming and for alfalfa is possible within certain areas by pumping. Rainfall records indicate that the rainfall increases rapidly with altitude so that the water supply of this valley is in a large measure dependent upon surface flow from the surrounding mountain canyons. Ground water studies in the valley south of the Pearce Hills indicate that irrigation water is available by both deep and shallow pumping. It is stated that the caisson curb of reinforced concrete is adapted for developing the shallow wells of the valley and the equipment for building and sinking such curbs is described.

From a study of the use of windmills for irrigation pumping the following conclusions are drawn: The galvanized steel windmill is much preferable to the wooden mill. Towers may be of wood if the cost is much reduced thereby, though 3-post steel towers are better. Back-gearred mills should be used for all sizes up to 16 ft. Larger sizes may be direct stroke. Where ground water is shallow and the cost of wells is slight it is better to use 2 or more small mills than one larger one, since the cost of windmills increases with the size much faster than does the power. Windmills for house service should be lightly loaded, but for irrigation they should be heavily loaded so that they will utilize strong winds though they stand idle in light breezes. Small earth reservoirs are desirable in connection with windmills.

An examination of the small artesian area at Bear Springs in Graham County indicates that the wells of this area appear to be in fairly good pervious material, but the pressure head is not enough to bring the water much higher than the ground surface along the fault-line. In an experiment made to determine the effect of increasing the artesian head the yield of one of the wells was increased from 11 gal. to 20 gal. per minute by digging a trench to it so that the outlet was lowered 6½ ft. A tunnel was then run from an adjacent arroyo, tapping the well at a depth of 23 ft., which increased the discharge to 65 gal. per minute. This suggests the practicability of drilling larger wells, freeing them

by hard pumping for some hours and then tapping them with tunnels from the level of the bottom land a few hundred feet away.

Concrete pipe and overflow basins for distributing irrigation water, E. C. MILLS (*Engin. Rec.*, 67 (1913), No. 24, pp. 652-654, figs. 5).—Tests made on 1:4 gravel concrete pipe, manufactured by the "wet tamp" process, for underground distribution of irrigation water in the Sacramento Valley project resulted as follows: Two 18-in. pipes with both ends plugged with concrete and mortar joined, pulled apart at 40 lbs. pressure without injury to the pipe; 2 18-in. pipes, similarly joined and so placed as to prevent longitudinal rupture, withstood an internal pressure of 35 lbs. for 1 hour and broke at 60 lbs. pressure; a 16-in. pipe similarly arranged broke at 55 lbs. and a 10-in. pipe at 70 lbs. pressure.

Two general systems of underground distribution, both of which gave satisfaction on this project, are the open or overflow system, adapted to hillside planting, and the closed or pressure system, adapted for use where an artificial head is required for proper distribution. In either system the water is delivered to the main pipe through a measuring box equipped with a measuring weir, and to the branch lines through similar measuring boxes placed at points of diversion from the main line. Since the allowable head on unreinforced pipe lines is taken not to exceed 10 ft., concrete overflow basins or standpipes of proper height are placed at intervals to relieve the line of any excessive pressure. These overflow basins are also conveniently arranged for irrigation and are equipped with vertical slide gates to regulate the flow.

It was found that pipe to withstand more than 10 ft. head or to be placed under more than 4 ft. of backfill, or both, should be reinforced, or have extra-heavy cement joint collars, or both. At the top of every rise in the line air valves should be installed to relieve the air pressure and to prevent water hammer when the line is being filled.

The approximate cost per foot of concrete pipe lines in the Sacramento Valley including trenching and backfilling was from \$0.28 to \$1.55 for pipes of sizes varying between 8 and 36 in.

Convolute tube wells for irrigation, T. A. M. BROWNLIE (*Agr. Jour. India*, 8 (1913), No. 2, pp. 145-156, figs. 2).—From his own and other experiments the author concludes that drawing water from the ordinary type of well for any length of time, at a rate exceeding the critical velocity of the subsoil below the well, results in silting and in a loosening of the subsoil, causing the well to sink and collapse. This critical velocity has been found to be between 2½ and 3 ft. per hour.

Experiments conducted with tube wells of various forms in several conditions of subsoil, natural and artificial, resulted in a conclusion that water may be withdrawn constantly from these tubes at a rate which represents the velocity through the waterway area of the strainer of from 40 to 60 times the critical velocity of the subsoil. For domestic purposes the so-called Abyssinian tube well is suggested, and for irrigation and other purpose requiring heavier pumping the convolute tube well.

Data from service tests of 40 wells equipped for irrigation and operated by bullock power indicate that the average plant costing a total of about 1,300 rupees (about \$421) will pump 2,400 gal. per hour at a cost of 1 anna (about 2 cts.) for 1,305 gal. Data from service tests of several wells with the equipment driven by steam or oil engines indicate that the average plant costing about 6,000 rupees (\$1,944) will pump about 25,000 gal. per hour at a cost of 1 anna for 1,800 gal., showing an increase of practically 40 per cent over bullock power.

It is concluded that by the use of tube wells worked with properly selected pumps and oil engines lift irrigation can be effected at a rate considerably cheaper than by any other method in use in India.

Cost of water per acre (*West. Engin.*, 2 (1913), No. 5, pp. 379-383).—Tables of data are given comparing the cost of water per acre as supplied by a large number of recently constructed private, Carey Act, and United States Reclamation Service irrigation projects. This cost averages nearly \$53 on the private and Carey Act projects, as against \$41 on the Reclamation Service projects. Summing up the advantages of lower first cost, absence of interest, more dependable water supply, and more complete works for the Reclamation Service projects, it is concluded that water is obtained from these projects at from one-half to two-thirds the cost of that from the private and Carey Act projects listed.

Water resources (*Rpt. Oreg. Conserv. Com.*, 1912, pp. 34-52, figs. 4).—It is stated that the average precipitation in eastern Oregon ranges from 8 to 15 or 20 in. and that there are only 3 general localities where there is a large excess of water which can not be utilized, viz, the lower Klamath, lower Deschutes, and lower Grande Ronde rivers, on account of low elevation. In practically all the rest of eastern Oregon there is an excess of land that can be canaled over the amount of available irrigation water. In western Oregon there is a heavy run-off which is insufficiently distributed throughout the year to be of the highest utility for irrigation.

Records of river discharge and a brief summary of the storage and irrigation possibilities of the most important streams of the State indicate that there is a sufficient water supply to irrigate 4,000,000 acres of land. An inventory of the available irrigation waters of the State is given in tabular form, as is also a classification of the irrigated areas by the character of each enterprise. The latter shows that only 7 per cent of the total has been watered through the United States Reclamation Service, the State under the Carey Act, and irrigation districts, whereas 11.3 per cent has been watered by commercial projects and 81.7 per cent by individual or cooperative enterprises.

A suggested remedy for these conditions embodies a constitutional amendment providing for a bond issue for irrigation and water power development by the State, the money expended to be secured by a lien on the land developed or works constructed, and the work to be carried on in cooperation with the Reclamation Service.

A preliminary report on the Quincy Valley irrigation project (*Wash. Geol. Survey Bul.* 14, 1912, pp. 49, pls. 7).—This report includes papers on the soils of the valley, by A. W. Mangum; chemical analyses of the soils, by H. K. Benson; climate, by E. J. Saunders; and irrigation problems, by J. Jacobs. Maps and illustrations of the project accompany the report.

Annual irrigation revenue report of the Government of Bengal for the year 1911-12 (*Ann. Irrig. Rev. Rpt. Bengal, 1911-12*, pp. 6+17+33, pl. 1).—This report states that the capital outlay on major irrigation works up to the end of March, 1912, amounted to \$3,603,176, the works constructed for this outlay comprising 2 weirs, 98.75 miles of main and branch canals, and 254.5 miles of distributaries. The total receipts from these works for the year amounted to about \$90,000 and the working expenses to about \$95,600. The area irrigated was 80,975 acres, an increase of 7,035 acres over the preceding year, due to insufficient rainfall at the beginning of the irrigation season.

The capital outlay on minor irrigation and navigation works was about \$128,000 during the year and aggregated \$3,720,000. The receipts for the year amounted to about \$204,000 and the working expenses to about \$141,500.

Kopjes irrigation scheme, Orange Free State, J. MULLER (*Agr. Jour. Union So. Africa*, 5 (1913), No. 4, pp. 545-553, fig. 1).—Analyses were made of samples of soil taken from lands included in the Kopjes Irrigation Project for the purpose of ascertaining the existence of injurious quantities of alkali salts at the surface of irrigable areas or in sufficient quantities in the substrata of such areas as to render the surface alkaline after repeated irrigation. The results of these analyses forcibly emphasize the necessity of improving the soil texture by efficient underdrainage, cultivation, and the use of lime.

Analyses of the water supplies available for irrigation indicate that they are suitable for the purpose, provided the soil drainage is reasonably good.

River discharge, J. C. HOYT and N. C. GROVER (*New York and London*, 2. ed., rev. and enl., 1912, pp. XII+173, pls. 8, figs. 38).—This, the second edition of this book (E. S. R., 19, p. 512), is a revision in which are noted the material advances which have been made in the development of methods and instruments for stream gaging. The authors have attempted to incorporate the latest practice in stream gaging work and have added considerable hydrographic and actual stream flow data.

Superelevation at bends on roads, R. RYVES (*Surveyor*, 43 (1913), No. 1114, pp. 794-796, figs. 4).—From the results of several studies a comparison is made of the limits of safe and useful employment of superelevation at bends on roads and on railroad curves. It is concluded that the principle of superelevation as applied to railroad curves can be safely applied to road beds to only a very limited degree and that the best policy is to allow only such superelevation as is correct up to some low and definitely fixed speed limit.

General specifications for roads and bridges, C. HILL ([*Columbia, Mo.*]: *State Highway Engin.*, [1911], pp. 51).—This pamphlet refers to the state road laws of Missouri and gives general specifications for the construction of rock, gravel, telford, and sand-clay roads; steel, concrete, and masonry highway bridges; bituminous binders; surface and penetration road oils; road tar; and culvert pipe.

How Reclamation Service makes concrete pipe (*Cement Era*, 11 (1913), No. 6, pp. 58, 59, figs. 5).—This article describes the methods employed by the Reclamation Service in the construction of plain and reenforced concrete pipe for conveying irrigation water and reports the results of service tests on several lines of various sizes and types of construction.

Unreenforced concrete pipe of small sizes manufactured by the dry-mixed process has been found to be generally unsatisfactory for pressure pipe. The maximum allowable heads under which these pipes may be used under the most favorable circumstances are given as 20 ft. for 6 in. pipe, 15 ft. for 8 in. pipe, 12 ft. for 10 in. pipe, and 10 ft. for 12 in. pipe, and it is stated that unreenforced pipes of larger diameters than 12 in. can not be safely used under pressure. A thickness of shell of less than 2 in., even for the smallest pipe, has been found to be impracticable. Several finished reenforced pipe lines varying from 8 to 54 in. in diameter and under maximum heads varying from 22 to 115 ft. were tested under full pressure with satisfactory results.

Effect of moisture on the strength of concrete: An explanation of concrete drain tile failures (*Cement and Engin. News*, 25 (1913), No. 6, p. 177).—Experiments conducted by S. M. Woodward and F. C. Young indicate that 1:3 Portland cement mortar cured in air under conditions similar to those commonly obtained in the manufacture of cement drain tile was weakened from 40 to 50 per cent by being soaked with water, the weakening effect taking place as soon as the specimens were saturated. This is considered a physical and not

a chemical change and is advanced as an explanation of concrete tile drain failures within a few hours after laying.

Control of initial setting time of Portland cement, E. E. WARE (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 5, pp. 369-371, fig. 1).—The results of a large number of experiments to test the retarding effects of different added materials, such as gypsum, hydrated lime, calcium chlorid, and acids on the initial setting time of rapidly setting Portland cement are reported as apparently unsuccessful, and these, in connection with the opinions of various authorities as to the cause of the quick setting of cements, indicate that it is not due to free lime. Additional experiments along the line of hydration were tried with satisfactory results, the cement ground from clinker, which showed an initial set of from 3 to 5 minutes under the ordinary procedure, being slowed to from 2½ to 3 hours when hydrated to the extent of less than 2 per cent.

No definite conclusions are made, due to the continuation of the experiments to determine the action of alumina and gypsum during initial setting.

Power transmitting capacities of pulleys, J. S. LEESE (*Power*, 37 (1913), No. 18, pp. 628, 629, fig. 1).—The results of a number of tests made to determine the relative transmitting power of wood, paper, and cast-iron pulleys with leather belts show the maximum transmitting capacity, of paper pulleys to be 29.8 per cent better than cast-iron, and 107.7 per cent better than wooden pulleys.

Measurements made during these tests to compare the temperatures of the surfaces of pulleys show the wood pulleys to be the hottest, paper next, and cast-iron the coolest with a constant power of 8 h. p. per square inch cross section of the belt, and the paper the hottest, with the wood a close second, under a constant belt speed of 3,500 ft. per minute.

The prony brake and its use, H. M. PHILLIPS (*Power*, 37 (1913), No. 19, pp. 688-690, fig. 1).—This article gives an elementary explanation of the prony brake, describes common errors in its application, and gives complete directions for its correct use.

The effect of added fatty and other oils upon the carbonization of mineral lubricating oils, C. E. WATERS (*U. S. Dept. Com. and Labor, Bur. Standards Technol. Paper 4, 1911, pp. 14*).—The results of tests are given for determining the amount of carbonization of a straight mineral engine oil flashing at 140° and of the same oil with known amounts of other constituents, such as lard or rosin oil, tallow, etc.

The results indicate that the admixture of other oils with the mineral oil caused a greater or less diminution in the amount of insoluble and total residue. The addition of asphalt increased the percentage of insoluble residue. Sulphur and paraffin caused no marked difference, while linseed oil enormously increased the amount of total residue.

It is concluded that the addition of various oils and substances to a straight mineral oil affects the amount of carbonization and that lubricants containing soap in quantity, rosin, and asphalt, or which have been exposed to the action of sunlight and air, are to be avoided. The addition of tallow and lard oil is not recommended, although low results were obtained with such mixtures, since the presence of the fatty acids resulting from the decomposition of the oils may greatly increase the corrosion of the engine cylinder and in actual practice cause as much carbonization as the direct addition of ferric oxid.

Machinery adopted for use on moor plantations, H. ÅKERBERG (*Svenska Mosskulturför. Tidskr.*, 27 (1913), No. 2, pp. 116-137, figs. 33).—This article describes machinery and tools used in the farm work at the Flahult Moor Culture Station.

Design and operating features of motor-driven pumps, C. A. CARPENTER (*Elect. World*, 61 (1913), No. 24, pp. 1309, 1310, figs. 2).—In a study of the design of motor-driven centrifugal pumps the author, by a mathematical discussion and a unit speed comparison of centrifugal pumps of homologous design, shows that a particular design of pump for best effect and at ideal conditions has one unit speed, and that only special conditions can be met by such a pump with fixed speeds. He concludes that for motor-driven pumping machinery established design can not be depended upon and that special design is necessary. High efficiency is desirable, and the horsepower characteristics, including the maximum and starting horsepower, must be such that the motor can not be dangerously overloaded.

[Cost and service comparisons of motor trucks and horse-drawn vehicles], C. BRETTELL (*School Mines Quart.*, 34 (1913), No. 3, pp. 241-258, figs. 6; *abs. Engin. and Contract.*, 39 (1913), No. 20, pp. 538-542, figs. 4).—Curves and data are given from several years' comparative tests of the speed, convenience, reliability, and economy of motor and horse-drawn trucks. The comparison of economies is based on cost per ton mile, computed from both the fixed and the variable or mileage charges.

The results in general are in favor of the motor truck. For low daily mileages up to 18 miles the 3-horse truck is more economical owing to the time required in loading and unloading, but the motor truck has the advantage of being able to operate economically over a daily mileage varying from 15 to 75 miles. In addition quick loading and unloading devices are being put on the market which the tests indicate will allow motor trucks to operate at a low daily mileage with an economy equal to or greater than the horse trucks, since the average daily mileage for a horse truck is taken at only 10 or 12 miles, thus greatly increasing the ton mile cost.

Comparison of different kinds of silos, M. L. KING (*Amer. Thresherman*, 16 (1913), No. 2, pp. 82, 83).—In a comparison of 10 different types of silos a table is given in which the different types are arranged in the order of their relative merits, as regarded by the author, in regard to tightness and rigidity, durability, cost, amount of care required, convenience, and frost-proof qualities. The Iowa silo of reenforced hollow tile is placed first among the different types, with the stave silo and concrete and cement silos following.

The construction of silos in stone and brick, W. S. H. CLEGHORNE (*Agr. Jour. Union So. Africa*, 5 (1913), No. 4, pp. 535-545, figs. 5).—This article gives information to be used in the construction of both pit and above-ground silos and furnishes detailed plans for a square silo in stone or brick, which it is stated is the type of silo most likely to be built by the farmers of South Africa.

RURAL ECONOMICS.

Social and economic survey of a rural township in southern Minnesota, C. W. THOMPSON and G. P. WARBER (*Univ. Minn. Studies Econ.*, 1913, No. 1, pp. V+75, pls. 11, figs. 41).—This publication presents the results of a special survey covering a township in southern Minnesota, conducted by the Bureau of Research in Agricultural Economics of the University of Minnesota. It takes into consideration the various social, economic, political, educational, and religious activities in the township and their relation to the larger country life of which they are a part. The data were obtained first-hand from 136 rural families living within the township as well as from the various markets and other agencies tributary to this region.

The population is shown to be made up as follows: Swedish 2.9 per cent, Irish 3.7 per cent, English 5.8 per cent, American 11 per cent, mixed 21.3 per

cent, Norwegian 24.2 per cent, and German 30.8 per cent. A gradual decrease in the rural population with an increase in village population is noted since 1880. The decrease is attributed to the efflux from country to city and the decline of the birth rate in rural sections, the birth rate per 1,000 inhabitants being 41.5 in 1860, but only 14.7 for the last 5 years.

Diagrams are given showing the number of hours the average farmer gives to sleep, meals, recreation, and work, summer and winter; convenience of water supply in farm homes; percentage of families buying from peddlers and catalogue houses; membership in leading farmers' organizations; percentage of farmers reached by various kinds of reading matter; church membership and percentage that attend church, by nationalities, etc. Other diagrams show that 48 per cent of the homes produce berries on the farm, 53 per cent apples, and 76 per cent winter vegetables; 79 per cent have good gardens, 13 per cent poor gardens, and 8 per cent no gardens; in 16 per cent of the homes women do field work, in 32 per cent milking, in 71 per cent garden work, and in 79 per cent the care of poultry; 48 per cent of the farmers dispose of their products through the farmers' creamery, and 37 per cent through centralizing plants; 31 per cent sell eggs for cash at times and 69 per cent trade out eggs at store.

A series of tables are also given summarizing data as applied to owners and tenants, illustrating some of the many lines on which information was gathered and tabulated, from which the following conclusions were drawn: (1) Farm machinery has decreased the amount of labor required by farmers but a changed type of farming has meant additional work which can not be reduced to machine process. (2) There is a scarcity of labor due to the fact that foreign labor is no longer coming in to replace the native sons who move to the city or go where land is cheaper. (3) Farmers' wives are not as anxious to leave the farm as their husbands, as 29 per cent of the men visited want to go to town to live as soon as they can afford to do so, while only 13 per cent of the wives had the same desire. However, girls seem to leave the farm more largely than boys, it being noted that 78 per cent of the sons over 21 years of age of present heads of families are now farming while only 47 per cent of the girls are living on farms.

The distribution of farm labor, O. R. JOHNSON (*Missouri Sta. Research Bul.* 6, pp. 53-88, figs. 5).—This bulletin presents the results of a careful study of the distribution of farm labor from the standpoint of labor equipment and labor requirements, suggesting lines along which it will be possible to work in arriving at the proper adjustment of the 2 factors. Tables and charts are given showing theoretical condition of employment and maximum efficiency; length of work-day for man and horse and the distribution of such labor by months and for various farm activities, as maintenance or upkeep of farm, care of live stock, production and marketing leading farm crops, etc.

It is noted that the average workman on the farms studied worked 3,272.3 hours per year, of which 931 hours were given to crop production. With reference to horse labor, 1,216.6 hours per horse were worked during the year, while 705.9 hours of this time were given to crop production. The dependence of horses on crop work and the independence of man labor on this same class is thus illustrated. The length of day worked varied in the case of man labor from 7.8 hours in February to 11.7 in June, and in case of horse labor from 1.2 hours in January to 6.4 hours in May, the average being man 9.9 and horse 3.9. The labor required for care of work stock varied from $4\frac{1}{2}$ to 7 per cent of the total labor used on the farm, the cost being from 4 to 6 cts. per day per horse.

The 3 classes of labor on the farms studied were divided up as follows: Maintenance, 17 per cent; crop production, 28 per cent; other production, 55 per cent. This uniformity was with man labor only, as the variation with horse labor was more marked, maintenance varying from 6 to 21 per cent, crop production from 51 to 69 per cent, and other production from 19 to 41 per cent. From this it is noted that effort should be made to reduce the percentage of labor given to maintenance by supplying employment otherwise than in crop production.

Theories of Karl Marx and land ownership, J. BARCIA Y TRELLES (*Rev. Inst. Agron. Montevideo, 1913, No. 11, pp. 69-89*).—This article presents a discussion of the theories of Karl Marx relative to the influence of concentrated capital upon labor and socialistic movements generally, and the effect it has upon the number of producers in various industries and the different sized industries, including agriculture. Tables are given illustrating the theories as applied to agriculture and land ownership in the United States and foreign countries.

The settlement of irrigated lands, C. S. SCOFIELD (*U. S. Dept. Agr. Yearbook 1912, pp. 483-494*).—The author aims in this article to consider and present briefly some of the social and economic features to be considered in the occupation or colonization of newly irrigated regions, holding that the mere occupation of the land by people engaged in crop production is not within itself a sufficient guaranty that it will be to the ultimate best interest of the settlers or the community. It is considered highly important that irrigated land be settled promptly, since the investments made in the construction and operation of irrigation works constitute a charge against the land whether it is used or not, but to avoid undue speculation and increase the chances of ultimate success, it is contended that the establishment of a permanent community, under the present methods of colonization, must take place slowly.

Some of the difficulties to be met in the settlement of irrigated lands are pointed out by the author, one of the most serious being the inflation of land values, which causes in many instances the prospective settler to become over-optimistic in the rapidly increasing land values and invest all of his available capital in land with the expectation of profiting by the unearned increment, forgetting that in the final analysis agricultural land is worth no more than it can be made to produce. To avoid this and other undesirable features of the present method of colonization some system of leasing the land with an ultimate option for purchase is suggested. It is observed that shortly after a new community gets started there is usually an overproduction of some one crop or a few crops. To avoid such overproduction and the period of depression which always follows, and to secure a better balance of economic conditions, the author suggests that more attention be directed to proper diversification of industries on each farm.

The article questions the advisability of promoting or developing agencies rendering any assistance or aid to settlers further than giving them a fair chance to make good through their own efforts and initiative.

State versus national control of public forests from the viewpoint of a western State (*Portland, Oreg.: State Conservation Com., 1913, pp. 8*).—The commission concludes that the movement aiming to transfer the National Forests to the State "is wrong in principle and would be disastrous in results."

Agricultural credit, JAMES WILSON (*U. S. Dept. Agr. Rpts., 1912, pp. 25-39*).—The contents of this article have been noted from another source (*E. S. R., 28, p. 593*).

The sources of rural credit and the extent of rural indebtedness, G. K. HOLMES (*Internat. Inst. Agr. [Rome]. Mo. Bul. Econ. and Soc. Intcl., 4 (1913),*

Nos. 4, pp. 116-132; 5, pp. 65-92).—A study of the history and sources of rural credit, and the extent of rural indebtedness in the United States, is here presented, based on data noted elsewhere (E. S. R., 28, pp. 190, 593).

Cost of distributing food products, C. L. KING (*Mich. Farmer*, 140 (1913), No. 19, pp. 572, 573).—This article discusses methods and cost of distributing food products from the farmer to the consumer, with special reference to the hands through which they pass, but excluding transportation facilities. The following table gives the prices received by farmers for certain types of produce shipped into Philadelphia from the outlying counties in 1912, as determined by the author in a special report to the mayor of Philadelphia. It also gives the prices paid by each set of middlemen and the consumer, and the percentages added to the cost thereby:

Prices received by the producer and each middleman and the percentage increase of each price over the preceding price.

Commodity.	Farmer's selling price.	Price at freight terminal.	Increase by freight charge.	Jobber's selling price.	Increase.	Wholesaler's selling price.	Increase.	Retailer's selling price.	Increase.	Total increase.
			P.c.		P.c.		P.c.		Per cent.	Per cent.
Butter (low grade) per lb. . . .	\$0.18½	\$0.19	2	\$0.21½	13	\$0.24	11	\$0.32@ .38	33@58	73@105
Butter (high grade) per lb. . .	.23	.23½	2	.26	10	.29	11	.40@ .45	38@55	74@96
Potatoes (low grade) per bu. . .	.53	.62	17	.68	9	.75	10	1.10@1.30	46@73	108@145
Potatoes (high grade) per bu. .	.63	.72	14	.80	11	.90	12	1.30@1.60	44@78	106@154
Eggs (low grade) per doz. . . .	.11	.12	9	.13½	12	.15	11	.25@ .30	67@100	121@173
Eggs (high grade) per doz. . .	.21	.22	4	.24	10	.27	11	.34	30	67
Huckleberries (low grade) per qt. . . . .	.04½	.05½	22	.06	9	.07	16	.12	71	166
Huckleberries (high grade) per qt. . . . .	.07	.08	14	.10	25	.11	10	.15	36	114
Blackberries (low grade) per qt. . . . .	.04	.05	25	.05½	10	.06	13	.12	100	200
Blackberries (high grade) per qt. . . . .	.06	.07	16	.08	14	.09	12	.15	66	150
Live poultry (low grade) per lb. . . . .	.06	.06½	7	.09	38	.11	22	.22	100	266
Corn per dozen. . . . .	.15							.40		157
Tomatoes per peck. . . . .	.32	.32½	1	.36	10	.40	11	.80	100	150

It is gathered from this table that the advance of price paid by the consumer over the price received by the producer ranges from 67 to 266 per cent, the average being 136 per cent.

A successful method of marketing vegetable products, L. C. CORBETT (*U. S. Dept. Agr. Yearbook 1912*, pp. 353-362).—This article makes a brief review of existing practices of marketing perishable crops, showing that the general method is one of independent action with small shipments and a wide variation in types and sizes of packages.

A careful analysis of the present system indicates that only from 33 to 36 per cent of the price which the consumer pays for perishable products reaches the producer. About 26 per cent of the cost to the consumer is required for transportation and from 5 to 10 per cent for commission. Dealers' profits range from 50 to 100 per cent, each, and it is noted that some of the perishable products carry as much as 8 distinct charges before reaching the consumer.

To eliminate a number of these charges a system of cooperative marketing is suggested. This, the author contends, would enable the producer to standardize the pack or package and guarantee the grade, reduce the cost of trans-

portation by shipping in carload lots, and reduce the cost of sales by establishing a reputation for a product so that it may be sold f. o. b. shipping point. It would insure a quicker delivery and decrease the cost to the consumer by saving one freight charge and sometimes commission or brokerage.

It is also urged that once in operation the cooperative system may be carried into other activities which will enable growers to purchase consumable supplies, secure short-time loans, provide their own insurance, conduct a system of crop reporting which will give them an accurate idea of the condition of the crops and of the market at any time, and, when conducted on a broad basis, prevent depreciation of the market by unwise distribution and untimely shipments.

Prices of farm products—comparison with recent years, JAMES WILSON (*U. S. Dept. Agr. Rpts. 1912, pp. 20-22*).—This part of the report compares the prices of farm products for 1912 with recent preceding years.

Comparing 1912 with 1911 the following decreases are noted: Barley about 36 per cent in price per bushel; the corn crop about 10 per cent; the oat crop about 25 per cent; hay about 19 per cent per ton; the potato crop about 43 per cent; the hop crop about 42 per cent; the flaxseed crop about 27 per cent; and the beet sugar and sugar cane crop about 22 per cent. A gain of about 25, 13, and 7.5 per cent, respectively, is noted in the price of the cotton, rice, and tobacco crops.

In comparing the price for the crop of 1912 with the mean of the preceding 5 years the following decreases are noted: Corn, 1.4; wheat, 9.1; oats, 20.4; barley, 13.7; cottonseed, 11.3; cotton lint, 1.8; flaxseed, 15.1; potatoes, 29.1; and wool, 9.8 per cent. Increases are noted as follows: Rice, 14; hay, 2.1; tobacco, 2; hops, 26.3; and eggs, 8.5 per cent.

Data showing comparisons of prices for other periods are also given.

Foreign trade in agricultural products, JAMES WILSON (*U. S. Dept. Agr. Rpts. 1912, pp. 22-24*).—Notes and data are here given showing the trend as to value and quantity of agricultural exports in 1912 as compared with former years. Compared with the average exports of 1900-1909, represented by 100, the exports of 1890-1899 were 79.7; the exports for 1910 were 85.7; in 1911, 107.8; and in 1912 the relative number was 147.9.

Data are given showing the decrease or increase of particular products in the export trade.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 15 (1913), No. 6, pp. 41-48*).—Notes and data are here presented showing condition of various crops by States June 1, 1913, with comparisons; comparative wholesale and retail prices of agricultural products; average prices paid to producers for important products on dates indicated; live stock receipts at market centers for 1911-1913 by months; and causes and extent of crop damage to various crops for the 4 years 1909-1912, inclusive; farm value of important crops, sugar cane production of Louisiana, 1911-12; temperature and precipitation statistics; productivity of various countries; monthly receipts and stocks of butter and eggs; apple production, estimates, and prices; cotton consumed and on hand April, 1913; seed used per acre and approximate average for the United States; and range of prices of agricultural products at important markets.

Agricultural statistics (*Trans. Highland and Agr. Soc. Scot., 5. ser., 25 (1913), pp. 337-360*).—Data showing acreage, yield, value, etc., of the various agricultural crops, the live stock and live stock products of Scotland, and the quantity, value, etc., of articles affecting agriculture imported into the United Kingdom for a period of years are here presented.

AGRICULTURAL EDUCATION.

Twelfth annual general report of the Department of Agriculture and Technical Instruction for Ireland (*Dept. Agr. and Tech. Instr. Ireland, Ann. Gen. Rpt., 12 (1911-12), pp. VI+183+356*).—This is a report on the department's administration and funds, and on the details of its work during 1911-12, including agricultural instruction, and presents data corresponding to the previous year (*E. S. R., 27, p. 597*).

Agricultural education and research (*Rpt. Bd. Agr. Scotland, 1 (1912), pp. XIX-XXV*).—One of the duties noted in this report of the new Board of Agriculture for Scotland is "to promote, aid, and develop instruction in agriculture, forestry, and other rural industries." A brief survey is given of the present status of agricultural education in Scotland, followed by a report on the work of the agricultural colleges and domestic training schools for girls and on the promotion of research.

Scheme of agricultural education (*Preston, England: Lancashire Ed. Com., 1913, pp. 82, pls. 12*).—This is an outline of the scheme of agricultural education to be carried out in 1913-14 in Lancaster County on the County Council Farm and in the dairy, poultry, and horticultural schools at Hutton, near Preston, and the County Council Agricultural School at Harris Institute, Preston, and in various other parts of the county.

Agricultural education in the United States, M. BEAUFRETON (*Rev. Econ. Internat., 10 (1913), II, No. 1, pp. 98-125*).—An account is given by the author of higher and secondary agricultural instruction, the rural school, and agricultural extension work in the United States.

Agriculture in public high schools, D. J. CROSBY (*U. S. Dept. Agr. Yearbook 1912, pp. 471-482, pls. 4*).—The progress of agricultural training in public high schools and colleges of the United States is briefly summarized in this article, showing that where 16 years ago there was no public high school teaching agriculture, there are now 1,910, of which 289 receive state aid. Types of secondary schools in which agriculture is taught are described, and data are given showing what 11 States have done in the way of appropriating funds to encourage the teaching of the subject. The article further outlines the character of the instruction given in the high school with reference to classroom instruction, laboratory and field work, agronomy, animal husbandry and dairying, horticulture, rural engineering and farm mechanics, community work, etc.

New ideals in rural schools, G. H. BETTS (*Boston, New York, and Chicago, 1913, pp. X+128*).—The author sees in the rural school the most potent factor in the country life movement as well as the most powerful check against the present drift from the farm. The new demand for efficiency is reaching the rural school and making itself felt in the relations of the school to the community, in the rural school curriculum, and in the teaching itself. Each of these phases is treated with discrimination and with a constructive aim in view.

School gardens (*Jour. Ed. [Boston], 77 (1913), No. 20, pp. 551, 552*).—School gardening has become an integral part of the school system in Memphis, Tenn., where the work is officially recognized and supervisors are employed by the school boards to direct it.

About 30 garden sites, varying from one-half acre to 1 acre, near the respective schools, have been prepared, and the necessary garden implements and seeds provided. About 2,000 boys from the fifth to the eighth grades, inclusive, devote 1½ hours each week to gardening under the supervisor and principal, while the girls of the corresponding grades sew.

A model school garden at the agricultural exposition of Paris in 1913, J. VERCIER (*Jour. Agr. Prat., n. ser., 25 (1913), No. 14, pp. 439-442, fig. 1*).—

The author gives historical notes on the school garden movement in France, describes a model school garden, and notes the object of school gardens and the results obtained in 13 years in Côte-d'Or. A plan of the model school garden at the Paris exposition is given.

Report of the work of the School Gardening Association in 1911 and 1912 (*Ber. For. Skolechar. Virks. [Denmark], 1911-12, pp. 48, figs. 21*).—This report comprises a summary of the activities of the School Gardening Association in 1911-12, and brief reports on individual school gardens in Denmark.

Civic welfare work and landscape gardening in the city of Cleveland, LOUISE K. MILLER (*[Cleveland, Ohio, 1912], pp. 10*).—An address given by the chief supervisor of this work.

Garden and playground nature study, J. E. FEASEY (*London, Bath, and New York [1911], pp. VI+7-184, figs. 71*).—The suggested observational studies in plant life, light, heat, etc., for primary and secondary schools contained in this volume have all been tested by experience. In the author's opinion "nature study should surely mean the study of nature; not merely the acquisition of facts, but the studious discovery of those facts, the 'finding out' of things for one's self, the observation of phenomena, and the discovery of their explanations. In other words, of all school subjects this should be experimental . . . the guided pursuit of knowledge by the use of one's senses, prompted by intellectual inquisitiveness."

School and home gardens, J. W. HUNGATE (*Dept. Agr. State Normal School [Cheney, Wash.], Bul. A, No. 3, 1913, pp. 23, figs. 8*).—This bulletin has to do with the location of the garden, preparation of the soil, arrangement of the garden, tools and appliances, and organizing the work. It also contains 10 practical exercises on the management of a garden.

Gardening and nature study (*Philadelphia: Bd. Pub. Ed. [1913], pp. 37*).—These lessons are intended for visiting classes and individual platholders in the school gardens of the public schools of Philadelphia.

Mississippi canning clubs, SUSIE V. POWELL (*South. Agr., 43 (1913), No. 12, p. 14*).—These clubs are organized by counties, being managed by an executive committee consisting of one teacher from each supervisor's district and usually a representative club woman and a business man. In some instances the local board of supervisors makes an appropriation for the work, in others the agricultural high school board supplements the salary of its home economics teacher. The latter plan of organization gives the work permanency, and also affords the agricultural high school opportunity to do extension work in agriculture and home economics. No work is begun until the county superintendent and his teachers pledge their cooperation, and sufficient funds are raised to secure the services of a county director.

The educational side of the work is stressed by correlating the arithmetic, language, nature study, geography, agriculture, and chemistry lessons around the club work as a center of interest.

The first clubs were organized in 1911, and in 1913 there were 20 county clubs.

During the first year the club girls put up about 5,000 cans of tomatoes. In 1912 they canned about 110,000. Profits of over \$10 each were realized in 1912 by 150 girls from one-tenth acre plats, and 16 girls cleared more than \$50 each.

The geological course for agricultural instructors, 1912, A. JENTZSCH (*Landw. Jahrb., 43 (1912), No. 3, pp. 373-404*).—A detailed description is given of the course in geology for agricultural instructors held in the Rhine Province in 1912. This course is offered annually by the Prussian Geological Institute by authority of the Prussian Minister of Agriculture.

Syllabus of home economics (*Baltimore, Md., 1913, pp. 69*).—In this syllabus, which was prepared for the American Home Economics Association by its committee on nomenclature and syllabus, the attempt has been made to present the possible content of home economics, in schematic form, grouped under the main divisions of food, clothing, shelter, and household and institution management. The first three are subdivided primarily into selection, preparation, and use, and the last into material basis, social contacts, activities and functions, and aims and results. These topics are further subdivided to suit the individual cases.

In the introduction, the use of the syllabus as an aid to the teacher in selecting the content of courses of instruction for different institutions and for different grades is discussed. In preparing this report special stress has been laid on physics, chemistry, and biology, economics, sociology, and other sciences which form the background of the complex called home economics, or are closely related to it.

As a whole, the syllabus makes it clear that home economics is a subject worthy of serious study. "Rightly combined with language, literature, and other long-established subjects, home economics can and does provide a well rounded college course of full cultural value and does not sacrifice anything essential to a broad education. Those who have given the subject most attention believe that, in addition, it has a special value in preparing directly for life and its problems."

The report appears as publication No. 1 for the Ellen H. Richards memorial fund.

MISCELLANEOUS.

Annual Reports of the Department of Agriculture, 1912 (*U. S. Dept. Agr. Rpts. 1912, pp. 1149*).—This contains the reports of the Secretary and heads of bureaus. The various reports are also issued as separates. In addition to the usual summary of the work of the Department during the year, the report of the Secretary contains data on prices of farm products, foreign trade in agricultural products, and agricultural credit, abstracted on pages 491 and 493 of this issue, and a review of the work of the Department during the past 16 years (*E. S. R., 27, p. 705*).

Yearbook of the Department of Agriculture, 1912 (*U. S. Dept. Agr. Yearbook 1912, pp. 784, pls. 70, figs. 19*).—This contains the report of the Secretary during the year as noted above; 24 special articles abstracted elsewhere in this issue; and an appendix containing a directory of the Department, the agricultural colleges and experiment stations, and state officials in charge of agricultural work; a review of weather conditions during the year 1912, by P. C. Day; and agricultural statistics of the principal crops, farm animals and their products, transportation, and imports and exports of agricultural products.

Twenty-third Annual Report of Arizona Station, 1912 (*Arizona Sta. Rpt 1912, pp. 655-723, pl. 1, figs. 4*).—This contains the organization list, an administrative report by the director on the work and publications of the station, a financial statement for the fiscal year ended June 30, 1912, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Fifth Annual Report of Williston Sub-Experiment Station, 1912 (*North Dakota Sta., Rpt. Williston Substa., 1912, pp. 68, figs. 7*).—This contains a report of work at the Williston substation for 1912. The experimental work recorded is for the most part abstracted elsewhere in this issue.

NOTES.

Alabama College and Station.—*Science* notes that Jesse M. Jones has resigned as head of the department of animal industry to become field agent for this Department in farm demonstration work in Maryland, Kentucky, and West Virginia. L. W. Shook, assistant in animal industry, has resigned to accept a similar position with the North Carolina Station, and will be accompanied by T. C. Bottoms as herdsman. J. M. Johnson, assistant in animal industry, has resigned to take up graduate work at the University of Missouri.

Arkansas University and Station.—The college of agriculture has just closed a series of one-week farm extension schools held in seven counties in the State, in which the State and local farm demonstration agents of this Department participated. The remote sections of the State were reached by the schools, and they were so successful that much attention has been attracted to the college as a result. The average number of farmers registering in the schools was 210.

Ernest Walker, professor of horticulture and horticulturist, has resigned to accept a corresponding position in the Alabama College and Station. W. L. Fowler, assistant professor of animal husbandry in the University of Arizona, has been appointed animal husbandman.

Kansas College and Station.—A new hog building and animal nutrition laboratory and a slaughterhouse have just been completed. The model mill for the study of problems in the milling industry is already in operation. Bids have been requested for the new animal husbandry barn, which will cost about \$20,000, and a new hog-cholera serum plant, to cost about \$12,000. The board of administration has allotted \$20,000 for repairs of the college buildings, the building of driveways, and the general improvement of the campus. The purchase of from 15 to 20 dairy cows has been authorized for the Fort Hays substation.

Recent appointments include the following: O. C. Miller, seed inspector; F. L. Bentley, assistant in agronomy; Lyman D. La Tourette, fellow in crops; John Seiglinger, fellow in soils; James P. Poole, assistant in botany; Karl B. Musser, a graduate of the college, as deputy dairy commissioner; H. L. Kent, principal of the secondary school of agriculture and associate professor of vocational education; W. E. Grimes (Kansas, 1913), superintendent of the agronomy farm, vice F. B. Lawton, resigned; Ray Gatewood, assistant in animal husbandry; G. E. Thompson, of this Department, field superintendent of the substation work; F. H. Merrill, assistant horticulturist, vice John R. Cooper, resigned; Dr. C. W. Hobbs, field veterinarian in the antihog-cholera campaign; H. E. Dodge, assistant in dairy husbandry; and H. B. Walker, of the extension department, as the representative of the college on the state board of irrigation.

The resignations are noted of C. D. Steiner, superintendent of boys' and girls' agricultural clubs, to become professor of agriculture in the University of Utah; George C. Wheeler, animal husbandman of the extension department, to become live stock editor of the *Kansas Farmer*; T. R. H. Wright, instructor in the animal husbandry department, to become live stock editor of the

Farmers Mail and Breeze; and E. G. Schafer, instructor in crops, to become professor of agronomy and agronomist in the Washington College and Station.

New Jersey College and Stations.—The state appropriations for 1913 aggregate \$97,500 to the college and \$83,700 to the station, in addition to \$10,000 for the live-stock commission and \$26,000 for nursery inspection and farmers' institutes. The college appropriations include \$6,000 for summer courses in agriculture, \$20,000 for short winter courses, \$20,000 for furnishing and equipping the agricultural buildings, \$7,000 for repairs and improvements, \$7,500 for the departments of bacteriology, biology, and botany, \$2,000 for the library, and \$5,000 for clay working and ceramics. The station items are \$28,000 for salaries, \$2,500 for improvements to the station building, \$3,000 for printing, \$3,000 each for poultry husbandry and floriculture, \$2,000 for the seed laboratory, \$1,000 for insecticide inspection, \$40,000 for mosquito extermination, and \$1,200 for the investigation of oyster propagation.

The plans for the new agricultural building have been completed, and work will be begun this summer. The building is to cost \$100,000, is to be of brick and concrete construction, and is to provide laboratory facilities for the research departments of the station and offices for members of the staff.

The first session of the summer courses in agriculture opened with an enrollment of 312 students.

The following appointments are noted: Alva Agee, chief of the extension department, as professor of soil fertility; A. W. Blair, associate soil chemist and bacteriologist of the college station, as associate professor of agricultural chemistry; M. A. Blake, associate professor of horticulture, as professor of horticulture; F. C. Minkler, assistant professor of animal husbandry, as associate professor; H. R. Lewis, instructor in dairy and poultry husbandry, as assistant professor of poultry husbandry; Dr. F. E. Chidester, instructor in biology, as assistant professor; George W. Martin as assistant in plant pathology; Glenn L. Pyle as assistant chemist; Joseph J. Williams as microscopist; and Robert Schmidt as assistant seed analyst. H. Clay Lint, a graduate of the Kansas College, has accepted the industrial fellowship in plant pathology, beginning July 15.

North Carolina College and Stations.—W. F. Pate, instructor in chemistry, has been appointed agronomist in soils, and F. N. McDowell assistant agronomist in soils.

Vermont University and Station.—Hon. Cassius Peck, whose retirement after twenty years' active service on the board of control has been previously noted, died July 12.

Fiftieth Meeting of American Veterinary Medical Association.—The fiftieth meeting of this association was held in New York City September 1-5, as already noted (E. S. R., 29, p. 301). An address on the history of the association, prepared by Dr. Alexander Liautard, the honorary president of the association and its sole surviving charter member, was presented. Dr. Liautard pointed out that while at the first meeting of this association the only States represented were New York, Pennsylvania, Massachusetts, New Jersey, Delaware, Maine, and Ohio, and a large part of those in attendance were physicians, agriculturists, and other nonveterinarians, by 1889 25 States were represented. Subsequently its membership has extended over the entire American continent, causing a change of name from the United States Veterinary Medical Association to the American Veterinary Medical Association.

The address of J. R. Mohler, of this Department, as president of the association, already referred to, dealt with the world-wide progress made in veterinary science during the last few years. Special stress was laid upon the part which the American veterinarian has played in its advancement.

M. P. Ravenel, of the University of Wisconsin, discussed some aspects of the tuberculosis problem. He cited statistics which showed that human subjects under 1 year of age are more susceptible to tuberculosis than when older, and that a great danger lies in the transference of this disease from bovines to infants through the agency of milk. W. A. Evans, professor of hygiene in Northwestern University, also spoke on milk as a factor in the transmission of disease.

As chairman of the special committee on veterinary college investigations, D. M. Reynolds reported a list of the schools acceptable to the association, with recommendations for future work. N. S. Mayo, for the special committee on advertisements of veterinary remedies, reported that its activities had been confined chiefly to disseminating information in regard to the composition of many of the so-called fraudulent veterinary remedies which are being extensively advertised. The heads and other officers of agricultural colleges and experiment stations were asked to use their influence in checking this traffic and to refrain from giving testimonials to companies exploiting goods of this character. Reports were also submitted by the committee on agricultural college investigation and the committee on the revision of veterinary anatomical nomenclature, from the delegates to the Farmers' National Congress, the International Congress on Hygiene and Demography, and the National Association for the Study and Prevention of Tuberculosis, and on the progress made by the International Tuberculosis Commission.

The report of the special committee on glanders, given by E. B. Ackerman, dealt with the study of modern diagnostic methods. The opsonic index and conglutination test were considered laborious and impracticable, and the precipitation test unreliable. An agglutination value of over 1:1,000 is regarded as indicative of glanders, but as high agglutination titers are obtained only in the acute form of the disease, it is advisable to carry it on in combination with the complement fixation method and to diagnose the disease on the basis of both tests. The ophthalmic test was recommended as the one which would meet all the requirements for the veterinarian, and consequently as the test which should be utilized by state and federal authorities in their activities against this disease. J. R. Mohler and A. Eichhorn reported the results of their investigation of immunization tests with glanders vaccine, and B. T. Woodward arraigned the public drinking trough for the dissemination of glanders among animals.

A symposium on forage poisoning, or so-called equine cerebro-spinal meningitis, was participated in by the sections on sanitary science and police and veterinary medicine. The view was taken that the disease is either caused by spoiled fodder or that certain enzymes are present which under certain conditions will liberate hydrocyanic acid.

In a paper on the tuberculin testing of cattle and hogs, C. M. Haring, of the California Station, pointed out that the intradermal method can be more satisfactorily applied to young calves and wild range cattle than the usual subcutaneous method. It was found especially useful in testing cattle during the hot seasons in the interior valleys of California, where the subcutaneous reaction was inferior in point of time, material used, etc. Under dairy conditions the intradermal test equals the subcutaneous method providing a 5 per cent solution of a tuberculin precipitated by alcohol is used. Since neither the intradermal nor the subcutaneous method will detect all the cases of tuberculosis, it is advisable to apply the two tests at the same time. Tuberculins containing 5 per cent or more of glycerin can not be used for the intradermal test.

S. H. Gilliland and C. J. Marshall reported an investigation in which immunity was produced in cattle by intravenous injections of nonvirulent, human type

tubercle bacilli. S. H. Ward gave a résumé of work in regard to eradicating tuberculosis from a herd of pure-bred animals.

W. L. Williams gave an account of his findings on contagious abortion of cattle by studying the granulations obtained from the genital tract, and compared them with the results of the biological blood tests. E. C. Schroeder reported finding the bacillus in milks sold in the District of Columbia, some of them special milks and evidently designed for infant-feeding purposes. Special stress was laid on the necessity of pasteurizing milk, since this organism is capable of infecting many species of animals. W. E. Cotton reported a study intimately connected with this on the persistence of the bacillus in the tissues. Many cases were cited where the organism was noted in the uterine secretions, the placenta, or the milk. In discussing methods for immunizing against this condition it was pointed out that a subcutaneous or intravenous injection of living abortion bacilli before conception is unsafe, as it may become a source of the disease and contaminate the milk of the animal. One cow was found to eliminate the bacillus with her milk for a period of four years. The organism also seems to persist for a long time in the tissues of guinea pigs, rabbits, and mice, and from the spleens of guinea pigs showing lesions it was recovered from 71 to 77 weeks postinfection.

K. F. Meyer and J. B. Hardenbergh, in a paper entitled *The Value of Abortin as a Diagnostic Agent for Infectious Abortion in Cattle*, showed that abortin is not a specific but may give valuable information under certain conditions. The intravenous method, when using a precipitated preparation, gave the best results. The conjunctival test was deemed valueless.

A paper on sanitary police measures against hog cholera was read by A. T. Kinsley. In the discussion it was maintained that many of the losses to-day are directly due to the unsatisfactory control of outbreaks of this disease by the State, the appropriations for such work being inadequate in practically all cases.

J. A. Kiernan and G. R. White, of Tennessee, described the measures utilized in eradicating the ticks in the Southern States and the effect upon the cattle industry. Their paper was illustrated with moving pictures.

The teaching of veterinary science in the agricultural course was discussed by M. Jacob, with special reference to the purposes to be accomplished, the branches to be included, and the necessity of a standard for a more uniform method of teaching. The course offered at the University of Tennessee was cited as a basis for discussion.

Among other papers of special interest which were read or presented by title were *Physiologic Principles in Therapeutics*, by P. A. Fish; *Therapeutics of Mastitis in Cattle*, by L. A. Klein; *A Preliminary Report on the Value of Leucocytic Extract from a Therapeutic Standpoint*, by R. A. Archibald; *Some Phases of Necrobacillosis in Cattle Practice*, by J. P. Turner; *Oophorectomy and its Economic Importance on Small Farms*, by G. B. Jones; *Rumenotomy*, by W. J. Martin; *Anesthesia, Local and General*, by H. E. Kingman; *A Contribution to the Etiology of Roaring*, by E. Merillat; *Apparent Inconsistencies of Biologic Diagnostics*, by R. A. Archibald; *Dairy Problems and the Municipal Food Inspector*, by A. W. Tracy; and *The Sanitary Barn and its Relation to Clean Milk*, by C. Way.

The officers elected for 1913-14 were C. J. Marshall, president; F. Torrance, A. Eichhorn, W. Reid Blair, R. A. Archibald, and M. Jacob, vice presidents; N. S. Mayo, secretary; G. R. White, treasurer; and J. N. Frost, librarian. The next meeting is to be held at New Orleans, La.

ADDITIONAL COPIES of this publication
A may be procured from the **SUPERINTEND-**
ENT OF DOCUMENTS, Government Printing
Office, Washington, D. C., at 15 cents per copy

Subscription price, per volume of 9 numbers, \$1





EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, PH. D., *Assistant Director*.
Assistant Editor: H. L. KNIGHT.

EDITORIAL DEPARTMENTS.

Agricultural Chemistry and Agrotechny—L. W. FETZER, Ph. D., M. D.
Meteorology, Soils, and Fertilizers—W. H. BEAL.
Agricultural Botany, Bacteriology, and Vegetable Pathology {W. H. EVANS, Ph. D.
W. E. BOYD.
Field Crops {J. I. SCHULTE.
G. M. TUCKER, Ph. D.
Horticulture and Forestry—E. J. GLASSON.
Foods and Human Nutrition {C. F. LANGWORTHY, Ph. D., D. Sc.
H. L. LANG.
Zootechny, Dairying, and Dairy Farming—H. WEBSTER.
Economic Zoology and Entomology—W. A. HOOKER, D. V. M.
Veterinary Medicine {W. A. HOOKER.
L. W. FETZER.
Rural Engineering—R. TRULLINGER.
Rural Economics—B. B. HARE.
Agricultural Education—C. H. LANE.
Indexes—M. D. MOORE.

CONTENTS OF VOL. XXIX, NO. 6.

	Page
Recent work in agricultural science.....	501
Notes.....	600

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Reports on the progress of chemistry for 1912, edited by Cain and Greenaway...	501
Heinrich Ritthausen, Osborne.....	501
Publications of Prof. Heinrich Ritthausen, Fetzer.....	501
Index of <i>Zeitschrift für Angewandte Chemie</i> , compiled by Rassow.....	501
On the "heat coagulation" of proteins, III, Chick and Martin.....	501
On the "heat coagulation" of proteins, IV, Chick and Martin.....	502
The lecithin of egg yolk, Riedel.....	503
Forms of sugar found in common fruits, Thompson and Whittier.....	503
The plant alkaloids, Henry.....	503
The amount of nicotin in the tobacco plant, Chuard and Mellet.....	503
The ethereal oils of the wood of the spruce, Klason and Segerfelt.....	504
Catalysis, Woker.....	504
Determination of the activity of commercial rennet preparations, Van Dam...	504
In what way is tartaric acid attacked by yeast? Karczag.....	504
The mechanism of the arrest of diastatic activity by filtration, Holderer.....	505
The saccharification of malt by its own diastase, Van Laer.....	505
Action of emulsin on gentiopicrin, Bourquelot and Bridel.....	505
A synthetic action of emulsin, Bourquelot and Bridel.....	505
New synthesis of glucosid alcohols with aid of emulsin, Bourquelot and Bridel..	505
Influence of dilution of ethyl alcohol on emulsin, Bourquelot and Bridel.....	505

	Page.
Supposed reversibility of hydrolysis of salicin, Bertrand and Compton.....	506
Analytical chemistry, Treadwell, trans. by Hall.....	506
The examination of waters and water supplies, Thresh.....	506
Food analysis, Bauer.....	506
Progress in the examination of foods and condiments for 1911, Beckurts et al..	506
An improved method of crude fiber estimation, Forbes and Mensching.....	506
Rapid control method for determination of oil in grains, Harding and Nye....	507
Method for milk fat in evaporated milk and milk powders, Harding and Parkin..	507
Catalase in butter, Hesse.....	508
The fatty acids of butter, Smedley.....	508
A new method for total nitrogen in urine, Folin and Farmer.....	508
The distribution of amygdalin, Rosenthaler.....	509
Choice of yeasts in detection of sugars and glucosids, Bourquelot and Hérisséy..	509
In regard to the technical-scientific work in potato drying, Parow.....	509
Fermentation in breweries, distilleries, etc., Delbrück and Haydick.....	509

METEOROLOGY—WATER.

Agricultural meteorological contributions.....	509
Annals of agricultural meteorology, edited by Brounov.....	510
The organization of a general service for agricultural meteorology, Rey.....	510
Agricultural meteorology, Poskin.....	510
International catalogue of scientific literature. F—Meteorology.....	510
Monthly Weather Review.....	510
Frost studies.—Determining probable minimum temperatures, McAdie.....	511
The rainfall of Berkeley, Cal., Reed.....	511
Surface water supply of North Pacific coast, 1910, Henshaw et al.....	511
Surface water of Hudson Bay and upper Mississippi River, Follansbee et al....	511
Surface water supply of western Gulf of Mexico, 1911, Follett et al.....	511
Water resources of Hawaii, 1909–1911, Martin and Pierce.....	511
Underground water resources of coastal plain province of Virginia, Sanford....	511
Sewage pollution of Missouri River from Sioux City to its mouth, McLaughlin..	512
Chlorid of lime in sanitation, Hooker.....	512

SOILS—FERTILIZERS.

The value of soil analyses to the farmer, Hall.....	512
Soils of the Hartford quadrangle, Jones.....	513
A botanical cross section of northern Mississippi, Harper.....	513
Economic products of the Virginia coastal plain, Watson.....	513
The salt marshes of the north coast of Porto Rico, Zerban.....	513
The origin, formation, nature, and culture of moors, Benze.....	514
Soils, Vipond.....	514
[Usar and regur soils], Leather.....	514
Contribution to regional weathering in ancient times, Blanck.....	514
Warping, Stephenson.....	514
Influence of various factors of growth on the maximum yield, Pfeiffer et al....	514
A note on the behavior of nitrate in cultivated soil, Vogel.....	515
The condition of soil phosphoric acid insoluble in hydrochloric acid, Fry.....	515
A study of bacteria at different depths in some typical Iowa soils, Brown.....	515
The prevalence of <i>Bacillus radiclecola</i> in soil, Kellerman and Leonard.....	515
The complexity of the micro-organic population of the soil, Bolley.....	515
Cereal cropping.—Sanitation, a new basis, Bolley.....	516
Crops and fertilizers at Swedish moor culture stations, 1912, von Feilitzen....	516
Cooperative fertilizer trials on Finnish moor soils, 1910–11, Malm.....	516
Fertilizers for moor land, von Feilitzen.....	516
Cave deposits of fertilizing value, Vipond.....	516
Guano Islands, Smith and Zeederberg.....	516
Seaweed burning in Norway, Leonard.....	517
The American fertilizer handbook, 1913.....	517
Importance of nitrogenous fertilizers, Turrentine.....	517
The nitrate fields of Chile, Tower.....	517
The Ostwald process for making nitric acid from ammonia.....	517
The fixation of ammoniacal nitrogen by permutite and clay soils, Hissink....	517
The assimilation of the nitrogen of peat, Hoc.....	518
Cyanamid.—Manufacture, chemistry, and uses, Franke.....	518

	Page.
Papers on potash and other salines, Gale.....	518
Production of available potash from natural silicates, Cushman and Coggeshall.....	518
Decomposition of feldspar and its use in fixation of atmospheric nitrogen, Ross.....	518
Potash, silica, and alumina from feldspar, Hart.....	518
Zeolitic properties of ground phonolite and lime trass fertilizer, Bussmann.....	518
The leaching of potash from freshly cut kelp, Merz and Lindemuth.....	519
The production of phosphate rock in 1912, Phalen.....	519
Phosphate mining industry of Algeria, Mason.....	519
On the value of Tunis phosphate for peat soils, von Feilitzen.....	519
A possible commercial utilization of nelsonite, Waggaman.....	519
Report on phosphatic fertilization, 1905-1910, Kristensen and Christensen.....	519
Utilization of natural phosphates and silicious lime as fertilizers, Pfeiffer.....	520
Analyses of agricultural lime sold in Maryland, McDonnell et al.....	520
Note on the influence of the lime-magnesia ratio upon plant growth, Loew.....	520
On the influence of the lime-magnesia ratio, Gile and Ageton.....	520
Pot culture experiments, 1910-11-12, Voelcker.....	520
Effect of sulphites, thiosulphate, and sulphur on growth of plants, Thalau.....	521
[Fertilizer inspection in Alabama], Ross.....	521
Fertilizer analyses, McDonnell et al.....	522
Analyses of fertilizers, spring season, 1913, Kilgore et al.....	522
[Fertilizer inspection in Ohio].....	522

AGRICULTURAL BOTANY.

Studies in Trifolium, Kennedy.....	522
Botanical and agronomic studies on Typha, Gèze.....	522
Pollination and cross-fertilization in the common rice plant, Hector.....	522
The weight of the seed planted and characteristics of the plant, I, Harris.....	522
Weeds in relation to soils—Norfolk, Brenchley.....	523
Effect of some Puget Sound bog waters on the root hairs of Tradescantia, Rigg.....	523
Relation of environmental conditions to permanent wilting in plants, Caldwell.....	523
Transpiration and retention of water vapor by plants, Leclerc du Sablon.....	524
The ascent and descent of water in trees, Ewart.....	524
The evaporation of water and the vegetable matter elaborated by maize, Mazé.....	525
Influence of oil reserves and temperature on respiration coefficient, Ivanov.....	525
The anaerobic respiration of different seed plants, Kostytschew.....	525
The pentosans in the germination of seed, Bernardini and Galluccio.....	525
Catalytic action of light in germination, Lehmann and Ottenwälder.....	525
Influence of illumination on formation and germinability of seeds, Combes.....	526
Energy assimilated by plants cultivated under different illuminations, Rosé.....	526
Plant cultures in colored light, Welten.....	526
Branch movements induced by changes of temperature, Grossenbacher.....	526
Reversibility of the physiological processes in the ripening of seeds, Ivanov.....	526
A physiological and chemical study of after-ripening, Eckerson.....	527
Cellulose as a source of energy for nitrogen fixation, McBeth.....	527
The fermentation of cellulose, Kellerman and McBeth.....	528
The question of cellulose fermentation, Omeliansky.....	528
The use of congo red in culture media, Kellerman.....	528
The physiological functions of calcium, Loew.....	528
Action of manganese dioxid and other compounds on germination, Varvaro.....	528
Effect of certain chlorides on the activity of malt diastase, Hawkins.....	528
Self-poisoning in cultures of Penicillium from nitrogen feeding, Welmer.....	528
Copper treatments and nitrification in the soil, Paturel.....	529
The effects of poisons at different concentrations upon seeds, Archovskij.....	529
Toxicity of smoke, Knight and Crocker.....	529
Injuries to plants by coal tar vapors from the Plania works at Ratibor, Ewert.....	530

FIELD CROPS.

[Field crop experiments], Clark.....	530
[Field experiments], Wilson.....	530
Sure feed crops, Fields.....	530
Experiments on permanent grass land, 1912, Kinch and Stapledon.....	530
Manuring experiments on grass for hay, Kinch, Turner, and Stapledon.....	530
Manurial experiments on meadows, Hotter et al.....	530
Influence of height of ground water table on yield of grass and hay, Pitsch.....	531

	Page.
Experiments on the culture and selection of some marsh crops in 1908-9, Geze..	531
Grazing investigations, Pearson.....	531
Measuring hay in ricks or stacks, McClure, Spillman, and Froley.....	532
The improvement of small grains at Macdonald College, Klinck.....	532
Methods of selection and choice of varieties in Russia, Stebut.....	532
Crossbreeding experiments with oats and wheat, Nilsson-Ehle.....	532
Collection and sowing of alfilaria seed, Sampson.....	533
Seed color in red clover, Gernert.....	533
A study of red clover seed with relation to its color, Eastman.....	533
The immediate effect on yield of crossing strains of corn, Carrier.....	533
Influence of width of rows on corn, Weiser and Zaitschek.....	533
Experiments in the selection of maize in Russia, Talanoff.....	534
How to manage a corn crop in Kentucky and West Virginia, Arnold.....	534
A brief history of corn improvement in Nebraska, Montgomery.....	534
Second annual report of Nebraska Corn Improvers' Association, Montgomery...	534
Cotton problems in Louisiana, Cook.....	534
Annual report of the imperial cotton specialist, Gammie.....	534
Selection of flax in Russia, Althausen.....	534
Hop investigations, Tartar and Pilkington.....	534
The effect of selection in pure-line oat work, Spragg.....	535
Experiments with <i>Phacelia tanacetifolia</i> , Hazelhoff.....	535
Cultivation of the potato, Gauthier.....	535
Potato growing in New Jersey, Duryee, jr.....	535
On the classification of cultivated rice, Kikkawa.....	535
Selection and improvement of a wild <i>Solanum</i> , Deneumostier.....	535
Varieties of sorghum for seed and forage, Talanoff.....	535
The soy bean in New Jersey, Voorhees.....	536
The variability of the nitrogen content of sugar beets, Andrlík and Urban.....	536
Selection of sugar cane to regenerate and improve varieties, Maxwell.....	536
Sweet potato culture, Kille.....	536
Tobacco breeding in Connecticut, Hayes, East, and Beinhart.....	536
Wheat investigations, Howard.....	538
Tillering as a factor in the desirable qualities of winter wheats, Grantham.....	538
Determination of germination energy of seeds from the time required, D'Ippolito.....	538
Studies of the wild oat, Atwood.....	538
Controlling Canada thistles, Cox.....	538

HORTICULTURE.

Respiration of fruits and growing plant tissues in certain gases, Hill, jr.....	538
The application of nitrogen in relation to fruit bud formation, Remy.....	539
The work of the Umatilla Experiment Farm in 1912, Allen.....	540
The selective improvement of the Lima bean, Shaw.....	540
Culture of tomatoes in California with special reference to diseases, Rogers....	540
Tomato culture in Idaho, Wicks.....	540
Pollination of the pomaceous fruits.—I, Gross morphology of the apple, Kraus..	541
Thinning apples, Batchelor.....	541
The peach, Salvadores.....	541
Oriental pears and their hybrids, Cox.....	541
Fibro-vascular system of quince fruit compared with apple and pear, McAlpine..	542
Sites, soils, and varieties for citrus groves in the Gulf States, Rolfs.....	542
Propagation of citrus trees in the Gulf States, Rolfs.....	542
Culture, fertilization, and frost protection of citrus groves, Rolfs.....	542
Pruning frosted citrus trees, Coit.....	542
The present status of date culture in the Southwestern States, Swingle.....	542
Pecan culture in Florida.....	542
The organization of a fruit distributing system, Reid.....	543
The home preparations of lime and sulphur mixtures, Farley.....	543
British violets, Gregory.....	543

FORESTRY.

Review of Forest Service investigations.....	543
Sixth report of the state forester of Connecticut for 1912, Filley.....	546
Growing forest trees in western Nebraska.—Shrubs and ornamentals, Snyder.....	546
An extraordinary phenomenon in a mahogany seedling, Rama Rao.....	546
So-called "osage orange rubber"—a product of Kansas, Fox.....	546

DISEASES OF PLANTS.

	Page.
Plant diseases, Bruck, trans. by Ainsworth-Davis.....	546
Recent researches on Citromyces, Bainier and Sartory.....	547
Notes on plant diseases of Connecticut, Clinton.....	547
Report of the station for plant pathology, Lüstner.....	547
Observations and studies on injuries to vegetation in Ratibor-Planja, Otto.....	547
[Plant diseases in Southern Nigeria], Evans.....	547
Comparison of plant and animal tumors, Vuillemin.....	548
Experiments on loose smut of grains, Appel and Riehm.....	548
A disease of rice, Novelli.....	548
<i>Phytophthora parasitica</i> n. sp., a new disease of the castor oil plant, Dastur.....	548
Sclerotinia on clover seed, Laubert.....	548
Diseases of ginseng, Vuillet.....	549
Investigations on potato diseases (fourth report), Pethybridge.....	549
Potato tuber diseases, Orton.....	549
Potato diseases and methods of control, Cook.....	549
Late blight and rot of potatoes, Barrus.....	549
Investigations of the potato fungus <i>Phytophthora infestans</i> , Jones et al.....	550
The rotting of potato tubers by a new species of <i>Phytophthora</i> , Pethybridge.....	550
Leaf roll of potatoes, Dix.....	550
The powdery scab of the potato in Maine, Melhus.....	550
The history of beet rot (<i>Rhizoctonia violacea</i>), Stift.....	550
The rôle of oxidases in curly top of sugar beets, Bunzel.....	550
Diseases and enemies of tobacco, Peters and Schwartz.....	550
The fire blight disease and its control in nursery stock, Stewart.....	551
Treatment of fruit trees with lime-sulphur wash, Marre.....	551
Concerning court-noué, Chappaz.....	551
On court-noué, Ravaz.....	551
The combat against grape mildew, Cadoret.....	551
Endocellular fibers in healthy vines and those affected with roucet, Mameli.....	551
Scorching of grapes, Ravaz.....	551
Silver thread disease of coffee in Surinam, Kuijper.....	552
Studies of a new species of <i>Peronospora</i> , Vincens.....	552
Further infection studies on <i>Ustilago antherarum</i> , Werth.....	552
Black spot of roses, Wolf.....	552
Diseases of trees, Bancroft.....	552
Notes on tree pathology, Savastano.....	552
Chestnut bark disease, Clinton.....	552
Cultural characters of chestnut blight fungus, Shear and Stevens.....	553
The resistance of the Japanese chestnut to black root rot, Farneti et al.....	553
Oidium of oak, Hauch and Ravn.....	553
The present status of the white-pine blister rust, Spaulding.....	554
A new disease of the larch in Scotland, Borthwick and Wilson.....	554
<i>Merulius sclerotiorum</i> , Möbius.....	554
Spraying mixtures, Chappaz.....	554
Adherent spraying mixtures, Astruc.....	554
Action of silver on <i>Aspergillus niger</i> , Clément.....	554

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The birds of Virginia, Bailey.....	554
Proposed regulations for the protection of migratory birds.....	554
Explanation of proposed regulations for protection of migratory birds, Palmer.....	555
Two new species of parasitic nematodes, Ransom.....	555
A new nematode, <i>Ostertagia bullosa</i> , parasitic in sheep, Ransom and Hall.....	555
Entomology with reference to its biological and economic aspects, Folsom.....	555
Injurious insects and other animals observed in Ireland, 1912, Carpenter.....	555
The enemies of barley, Noel.....	555
The asparagus miner and the twelve-spotted asparagus beetle, Fink.....	555
The enemies of the radish, Noel.....	556
The enemies of spinach, Noel.....	556
Control of two elm tree pests, Herrick.....	556
The mole cricket (<i>Scapteriscus didactylus</i>), Worsham and Reed.....	557
<i>Thrips tabaci</i> and its ravages in Hungary, Török.....	558
Cicadas as pests, Froggatt.....	558
The woolly aphid, Woodworth.....	558

	Page.
The oyster-shell scale (<i>Lepidosaphes ulmi</i>), Sherman, jr.....	558
The tent caterpillars, Swaine.....	558
The brown-tail moth, Vuillet.....	558
The oak tortrix in Italy (<i>Tortrix viridana</i>), Cecconi.....	558
Codling moth control in the Sacramento Valley, Woodworth.....	558
<i>Rabdophaga saliciperda</i> damaging willows in Italy, Cecconi.....	558
Progress in the control of the salt marsh mosquito, Headlee.....	559
How does the house fly pass the winter? Skinner.....	559
The stable fly, Bishopp.....	559
Attempts to transmit poliomyelitis by <i>Stomoxys calcitrans</i> , Sawyer and Herms..	559
Poliomyelitis.—Further attempts to transmit the disease, Anderson and Frost..	560
Biology of the apple maggot together with methods of control, Illingworth.....	560
Simultaneous destruction of <i>Colaspidea atrum</i> and dodder, Solanet.....	561
Common white grubs, Davis.....	561
Injury by <i>Conorhynchus lugionii</i> and <i>Lixus junci</i> to sugar beets, Rossi.....	562
Parasites of the apple weevil (<i>Anthonomus pomorum</i>) in Austria, Catoni.....	562
Some weevils of economic or biological importance, Pierce.....	562
Descriptions of new Hymenoptera, III, Crawford.....	562
Descriptions of new Hymenoptera, IV, Crawford.....	562
Descriptions of 1 new genus and 3 new species of ichneumon flies, Viereck....	562
Descriptions of 5 new genera and 26 new species of ichneumon flies, Viereck..	563
Descriptions of 21 new genera and 57 new species of ichneumon flies, Viereck..	563
<i>Conostigmus rodhaini</i> n. sp., an endoparasite of <i>Glossina palpalis</i> , Bequaert.....	563
The Argentine ant, Newell and Barber.....	563
New sawflies in the collections of United States National Museum, Rohwer...	563
Argas and spirochetes, Marchoux and Couvy.....	563

FOODS—HUMAN NUTRITION.

Study of bacteriology of foods on a physiological basis, Rahm.....	563
Meat poisoning and its administrative control, McMaster.....	564
Milk and its value as a popular article of diet, Herz.....	564
The nutritive and fuel value of cheeses, Herz.....	564
Egg yolks of foreign origin—preservation and use, Bordas.....	564
Judging egg pastes, Nockmann.....	564
The popular cooking fat in Austria, Hoover.....	564
The importance of ground cereals in the diet, Klotz.....	564
The physical chemistry of bread, Lorenz.....	564
The significance of loaf volume, Briggs.....	564
The digestibility of bread, and in particular army bread, Neumann.....	565
Calcium-magnesium ratio with special reference to bread, Emmerich and Loew..	565
The chemical composition of polished rice, Takahashi and Satō.....	565
Differences of varieties of <i>Aspergillus oryzae</i> , Takahashi and Yamamoto.....	565
Preliminary notes on the chemical composition of "miso," Takahashi and Abé..	565
Respiration, decay, self-heating, and composition of potatoes, Henneberg.....	565
The cooking of roots and tubers, Senn.....	566
Additional notes on roselle, Wester.....	566
Canarium nut milk as a food for infants, Boorsma.....	566
Biochemistry of seaweeds, Kylin.....	566
Tea infusions and their constituents, Smith.....	566
Nascent ozone as a preserving agent of foods, Éloire.....	566
Food inspection decision.....	566
Food and drug laws of Louisiana.....	566
Laws enforced by food and drug department of the State of South Dakota.....	566
[Pure food and drug report], McRae et al.....	567
[Food inspection], Saunders.....	567
A hygienic interpretation of the food supplied United States Army, Woodhull..	567
Food values and living on threepence a day, Cross.....	567
English cookery books to the year 1850, Oxford.....	567
Traveling kitchens, Walker.....	567
An electrical oven, Mohs.....	567
A temperature regulator, Esclançon.....	567
The effect of light on metabolism, Pincussohn.....	567
The mechanism of protein assimilation.....	567
Products of protein cleavage which produce fatigue, Weichardt and Schwenk..	568
Preparation of a substance which cures polyneuritis, Cooper.....	568

	Page.
The influence of nutrition on the amylase content of human saliva, Evans.....	568
Notes on the chemistry of feces, Grimbart.....	568
The absolute efficiency of the muscular contraction, Hill.....	568
Some effects of muscular exercise on women, Hartwell and Tweedy.....	568
Carbon dioxid excretion from work following forced breathing, Higley.....	569
Influence of barometric pressure on carbon dioxid excretion in man, Higley...	569
Calorimetrical experiments on warm-blooded animals, Hill.....	569

ANIMAL PRODUCTION.

Some new or little-known leguminous feeding stuffs.....	569
Monketoan melons as a cattle food, Noaks.....	569
Nutrients in green shoots of trees, Petry.....	570
Molasses as a feeding material, Weiser.....	570
Analyses of feeding stuffs, Hartwell.....	570
Studies in methods of developing stock-watering places, Jardine.....	570
Text-book of animal production, Pusch.....	570
Reversion in animal breeding, Wentworth.....	570
Form and functioning duties of the tendons of work animals, Disselhorst.....	570
[Animal industry in Russia], Larrass and Aubagen.....	570
[Live stock in Australia].....	570
Cattle raising in Jamaica, Robertson.....	570
British breeds of live stock.....	571
[Devon and South Devon cattle], Kidner and Drennan.....	571
Welsh black cattle, Saborsky.....	571
Life and environments of the breeds of cattle of Italy, Franchi.....	571
Similarities of the Gayal and Gaur [breeds of cattle], Schumann.....	571
Supply of store cattle and slaughter of young calves.....	571
Baby beef, Scholl.....	571
Calf rearing.....	571
Feeding value of lupine flakes, Stutzer and Goy.....	572
The cost of mutton production, Plumb.....	572
Dorset Horn sheep, Ensor.....	572
The Tasmanian Merino, Camden.....	572
Fat-tailed sheep, Ewart.....	572
Nutritive value of banana meal for fattening swine, Zilva.....	572
Pork production under California conditions, Thompson.....	573
Prague hams—meat prices, Brittain.....	573
The horse, Meysey-Thompson.....	573
Moorland ponies, Palmer and Mardon.....	573
Improvement of Mountain and Moorland breeds of ponies, Cecil et al.....	573
Government horse breeding in France and Hungary, Borden.....	573
Horse industry in Algiers, Trouette.....	573
Farm poultry, Watson.....	573
Poultry notes, Rolf.....	573
Hatching and rearing of chicks, Dougherty.....	574
Rearing chickens, Lewis.....	574
Winter egg production, Lewis.....	574
Report of the poultry expert, Laurie.....	574
Market poultry, Upton.....	574
Report on the poultry industry in Germany, Brown.....	574
Money in Reds, DeGraff.....	574
Large eggs in South Manchuria, Williamson.....	574
All about Indian Runner ducks, Teasley.....	574
Ostrich farming in Australia, Herbert.....	575
Crosses between pheasants and fowls, Ainsworth-Davis.....	575
On sterile and hybrid pheasants, Smith and Thomas.....	575

DAIRY FARMING—DAIRYING.

Feeding dairy cows, Haecker.....	575
Sorghum crops for silage.—Experiments with dairy cattle, Reed and Fitch....	575
Milk production, II, Scott.....	576
Winter fodder of milch cows in Denmark, Dunne.....	577
Selection and feeding of dairy cows, Lucas.....	577
Studies in milk records: The influence of fetal growth on yield, Gavin.....	577
The score card as a factor in judging dairy cows, Jensen.....	577

	Page.
Hereditary traits in milch stock as revealed by Danish control unions, Dunne..	578
The formation of cow-testing associations, Wing.....	578
Milking machines: Their efficiency in producing clean milk, Wing.....	578
Administration of extracts of pituitary body and corpus luteum to cows, Gavin..	578
Acidity of cows' milk, Chrétien.....	579
Observations on the fat globules in milk, Cooper et al.....	579
The enumeration and measurement of fat globules in milk, Cooper et al.....	579
Influence of temperature on the physical condition of milk fat, Van Dam.....	580
Slime-forming bacteria, Troili-Petersson.....	580
Sterilizing milk by electricity.....	580
Some weaknesses of the city inspection theory, Steffens.....	580
Farm butter making, Keithley.....	580

VETERINARY MEDICINE.

Text-book of pharmacology for veterinarians, Müller.....	580
The extra pharmacopœia, Martindale and Westcott.....	580
Yearly report on progress in veterinary medicine, edited by Ellenberger et al..	581
Report of the acting director of veterinary research, 1911, Theiler.....	581
Rapid method of producing precipitins and hemolysins, Gay and Fitzgerald..	581
Antibody formation during preparation of sera, Hindersson.....	581
Agglutination of different strains of <i>Micrococcus melitensis</i> , Nègre and Raynaud..	581
Melitensis and paramelitensis, Nègre and Raynaud.....	582
Identification of <i>Micrococcus paramelitensis</i> , Nègre and Raynaud.....	582
Algerian sheep and anthrax, Lhéritier, Fleury, and Tribout.....	582
Foot-and-mouth disease, McFadyean.....	582
Nuttallia and Piroplasma in piroplasmosis of solipeds, Dschunkowsky and Luhs..	582
The recent campaign against rinderpest on the island of Panay, Thomson.....	582
Tuberculosis, Balfour, Archibald et al.....	582
The staining of spores of the tubercle bacillus, Kirchenstein.....	582
Amount of tubercle bacilli in bile of tubercular animals, Joest and Emshoff....	582
The type of tubercle bacilli in the sputum of man, Weber and Dieterlen.....	582
Human tubercle bacilli in the milk of a vaccinated cow, Griffith.....	583
Tubercular antigens and antibodies, Calmette and Massol.....	583
Differentiation of active and inactive tuberculosis in bovines, Wyschelessky..	583
Comparative investigations of the tuberculin tests, etc., Assmann.....	583
Protective vaccination tests against tuberculosis, Krautstrunk.....	584
The protective vaccination tests of Krautstrunk, Klimmer.....	584
The transmission of anaplasmosis by means of ticks, Theiler.....	584
The transmission of East Coast fever by means of ticks, Theiler.....	584
Tick bite in British Columbia, Todd.....	585
Biology of the cattle tick as determined at Auburn, Ala., Graybill and Lewallen..	585
Dipping vats and dips, Cary.....	585
Inquiry into dips and dipping in Natal, Theiler and Gray.....	585
Oxidation of the arsenite of soda in dipping tanks, Williams.....	585
The toxic properties of arsenite and arsenate of soda, Muller.....	586
The reported hosts of <i>Cysticercus cellulosæ</i> , Ransom.....	586
The diagnosis of infectious abortion in cows, Hantsche.....	586
Diagnosing infectious abortion in cows, Schulz.....	586
Chronic diarrhea in cattle.—John's disease, Mellon and MacGinnis.....	587
Specificity of ultramicroscopic bodies in pleuro-pneumonia, Freiburger.....	587
Worms in sheep.—Some experiments in treatment, Henry.....	587
Forage poisoning or cerebrospinal meningitis, Mohler.....	587
Enzootic cerebrospinal meningitis (Borna disease) of the horse, Schmidt.....	587
Cerebrospinal meningitis (encephalitis) in horses in 1912, Udall.....	587
Parasitic mange in horses, asses, and mules.....	588
The cultivation of the fowl spirochete, Danulesco.....	588
Serotherapy and protective vaccination in fowl spirochetosis, Aragão.....	588

RURAL ENGINEERING.

Irrigation resources of California and their utilization, Adams.....	588
Meadow farming in the land of the Sieg [Siegerland], Heinemann.....	589
The right drain for the right place, Jones.....	589
A simple and economical method of burning lime, Arnold and Nichols.....	590
Progress reports of experiments in dust prevention and road preservation, 1912..	590
Rock asphalts of Oklahoma and their use in paving, Snider.....	591

	Page.
A new 2-cycle internal combustion engine, Lecointre	592
A note on steam plowing, Musto	592
New machines for vineyard spraying, Coupau	593
Stress analysis of circular tubes, Haukelid	593
Welding iron and steel, Tornquist	593
Silo construction in Nebraska, Chase	593
Silo construction in Nebraska, Chase	593
Vacuum cleaning, Cooley	593

RURAL ECONOMICS.

Modern agriculture, Zolla	594
Rural economy as a factor in the success of the church, Carver	594
Agriculture, banking, and the carrier, Elliott	594
Relation between railroad rates and the cost to the consumer, Welsh	594
To develop small farms	594
Industrial cooperation, edited by Webb	594
Association and agricultural cooperation, De Molins	595
Cooperative marketing, Ingling	595
Financing cooperative marketing, Retherford	595
Cooperative buying and selling as it affects producer and consumer, Giles	595
Waste on the farm, McDonald	595
Determination of value and revenue from fruits and vegetables, Löckermann	595
Cost of producing cauliflower, Dimon	595
Production and marketing of Egyptian cotton, Williams and Ousley	596
Earning of agricultural laborers	596
Agricultural laborers' wages and earnings	596
Hints to homeseekers, Geib	596
Statistics affecting British agricultural interests	596

AGRICULTURAL EDUCATION.

Principles and policies for a state system of vocational education	596
State-aided vocational agricultural education	596
Agricultural instruction in high schools, Robison and Jenks	597
Evolution of the high-school course in agriculture, Main	597
Consolidation of school districts, Cotton, O'Shea, and Larson	597
Report on agricultural and housekeeping schools in Norway for 1911-12	597
The Hanoverian Veterinary High School, 1778-1913, Meiszner	597
Government publications suitable for use of agriculture in schools, Skilling	598
Agricultural books, Frier	598
Farm life readers, Evans and Duncan	598
A method of recording results of students' work in the soils laboratory, Call	598
Animal husbandry for schools, Harper	598
An elementary course of food chemistry, Egdahl	598
School gardens, Lindholm	598
Improving school grounds, Cady	598
School gardens and garden work for children, Michalke	598
Home projects for school agriculture, Nolan	598
Corn clubs, tomato clubs, and county school fairs in Virginia, Settle	599
Organization and method of agricultural extension instruction, Miatello	599
Farm demonstration in agriculture	599

MISCELLANEOUS.

Thirty-sixth Annual Report of Connecticut State Station, 1912	599
Twenty-fifth Annual Report of Georgia Station, 1912	599
Biennial Report of Missouri State Fruit Experiment Station, 1911-12	599
Monthly Bulletin of the Department Library, May, June, 1913	599
Index to Yearbooks of U. S. Department of Agriculture, 1906-1910, Greathouse ..	599

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

Stations in the United States.

Alabama College Station:	Page.
Bul. 171, Feb., 1913.....	585
Bul. 172, Feb., 1913.....	552
California Station:	
Bul. 237, June, 1913.....	573
Bul. 238, May, 1913.....	540
Bul. 239, June, 1913.....	540
Circ. 99, June, 1913.....	574
Circ. 100, June, 1913.....	542
Circ. 101, June, 1913.....	558
Circ. 102, June, 1913.....	558
Connecticut State Station:	
Bul. 176, May, 1913.....	536
Thirty-sixth An. Rpt. 1912—	
Pt. 5.....	547, 552
Pt. 6.....	546, 599
Florida Station:	
Bul. 114, June, 1913.....	576
Georgia Station:	
Bul. 101, Dec., 1912.....	557
Bul. 102, Dec., 1912.....	553
Twenty-fifth An. Rpt. 1912 ..	599
Idaho Station:	
Bul. 76, Mar., 1913.....	540
Kansas Station:	
Circ. 28.....	575
Minnesota Station:	
Bul. 130, May, 1913.....	575
Missouri Fruit Station:	
Bien. Rpt. 1911-12	599
Nebraska Station:	
Bul. 137, May 26, 1913.....	546
Bul. 138, June, 1913.....	593
New Jersey Stations:	
Circ. 17.....	559
Circ. 18.....	549
Circ. 19.....	536
Circ. 20.....	535
Circ. 21.....	536
Circ. 22.....	574
Circ. 23.....	574
Circ. 24.....	543
Circ. 25.....	599
New York Cornell Station:	
Bul. 324, Dec., 1912.....	560
Bul. 330, Apr., 1913.....	536
Bul. 331, Apr., 1913.....	555
Bul. 332, May, 1913.....	541
Bul. 333, May, 1913.....	556
Circ. 17, Apr., 1913.....	578
Circ. 18, May, 1913.....	578
Circ. 19, May, 1913.....	549
Circ. 20, May, 1913.....	551

Stations in the United States—Continued.

Oregon Station:	Page.
Bul. 114, Jan., 1913.....	534
Research Bul. 1, pt. 1, Apr. 22, 1913.....	541
Porto Rico Sugar Producers' Station:	
Bul. 4, Apr., 1913.....	513
Rhode Island Station:	
Insp. Bul., May, 1913.....	570
Utah Station:	
Circ. 11.....	543
Circ. 12, July, 1913.....	541
Vermont Station:	
Bul. 168, Aug., 1912.....	550
Virginia Station:	
Bul. 202, May, 1913.....	533
Wisconsin Station:	
Bul. 229, Apr., 1913.....	589
<i>U. S. Department of Agriculture.</i>	
Farmers' Bul. 538.....	542
Farmers' Bul. 539.....	542
Farmers' Bul. 540.....	559
Farmers' Bul. 541.....	580
Farmers' Bul. 542.....	542
Farmers' Bul. 543.....	561
Farmers' Bul. 544.....	549
Farmers' Bul. 545.....	538
Farmers' Bul. 546.....	534
Food Insp. Decision 151.....	566
Bureau of Biological Survey:	
Circ. 92.....	554
Circ. 93.....	555
Bureau of Entomology:	
Bul. 122.....	563
Forest Service:	
Rev. Forest Service Invest., vol. 2.....	531, 533, 543, 570
Bureau of Plant Industry:	
Circ. 129.....	540, 542, 554
Circ. 130.....	528, 534, 590
Circ. 131.....	527, 532, 553
Weather Bureau:	
Mo. Weather Rev., vol. 41, Nos. 3-4, Mar.-Apr., 1913..	510, 511
Office of Experiment Stations:	
Bul. 254.....	588
Office of Public Roads:	
Circ. 99.....	590
Division of Publications:	
Bul. 10.....	599
Library:	
Mo. Bul., vol. 4, Nos. 5-6, May-June, 1913.....	599

EXPERIMENT STATION RECORD.

VOL. XXIX.

ABSTRACT NUMBER.

No. 6.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Annual reports on the progress of chemistry for 1912, edited by J. C. CAIN and A. J. GREENAWAY (*Ann. Rpts. Prog. Chem.* [London], 9 (1912), pp. IX+344, figs. 2).—This report deals with the progress made in general, physical, inorganic, organic, analytical, physiological, agricultural, and mineralogical chemistry, vegetable physiology, and radioactivity, continuing previous work (*E. S. R.*, 27, p. 616).

Heinrich Ritthausen, T. B. OSBORNE (*Biochem. Bul.*, 2 (1913), No. 7, pp. 335-339, pl. 1).—A detailed statement of the contributions of the late Prof. Heinrich Ritthausen to agricultural chemistry, with especial reference to pioneer work in plant protein chemistry.

Publications of Prof. Heinrich Ritthausen, L. W. FETZER (*Biochem. Bul.*, 2 (1913), No. 7, pp. 339-346).—This is a comparatively complete bibliography of his publications on agricultural and vegetable protein chemistry, embracing 138 titles.

Index of *Zeitschrift für Angewandte Chemie*, compiled by B. RASSOW ([*Register der*] *Zeitschrift für Angewandte Chemie*, Band 25, Hefte 27-52. *Leipsic*, 1912, pp. VII+2673-2828).—This number contains the author, subject, and patent index for the second part of volume 25 of this journal.

On the "heat coagulation" of proteins.—III, The influence of alkali upon reaction velocity, HARRIETTE CHICK and C. J. MARTIN (*Jour. Physiol.*, 45 (1912), No. 1-2, pp. 61-69, fig. 1).—In this work, which is a continuation of that previously reported (*E. S. R.*, 26, p. 306), the heat coagulation of proteins in the presence of free alkali (NaOH and MgO) was studied. The material used was recrystallized egg albumin from which the ammonium sulphate was removed by dialysis.

"Denaturation-rate of egg albumin in alkaline solutions is shown to be increased with increasing concentration of hydroxyl ions exactly as was previously shown to be the case with increase of hydrogen ion concentration in acid solution. Continuous removal of hydroxyl ions as denaturation proceeds takes place in alkaline solution, just as in acid solution hydrogen ion concentration was found to diminish. If precautions are taken to keep the concentration of hydroxyl ions constant during the process, denaturation proceeds as a reaction of the first order (as was also shown in the case of acid). If no such device is employed, denaturation-rate does not remain proportional to the concentration of unchanged albumin, but departs farther and farther from this value owing to the progressive fall in 'alkalinity.'"

"The influence of acids and alkalis on denaturation-rate is compared with their effect on the viscosity and precipitability by alcohol of protein solutions and upon the imbibition of water by protein. It is suggested that protein in the form of salts is in more intimate association with water."

On the "heat coagulation" of proteins.—IV, The conditions controlling the agglutination of proteins already acted upon by hot water, HARRIETTE CHICK and C. J. MARTIN (*Jour. Physiol.*, 45 (1912), No. 4, pp. 261–295, figs. 7).—The dispersion of denatured proteins by small amounts of acid or alkali is attributed to the electrical charge given to the particles. This charge, if neutralized, renders the proteins isoelectric. With the solution agglutination takes place.

"In common with other observers, we find that reaction of the solution is the principal factor in determining the degree of agglutination of denatured proteins. The optimum acidity for precipitation in absence of electrolytes is found to be at a concentration of hydrogen ions equal to about 3×10^{-6} normal in case of the denatured protein of both serum and egg-white, thus confirming the figure obtained by Michaelis and Rona for the isoelectric point of serum-albumin.

"Agglutination is greatly influenced by the presence of neutral salts. Their action is twofold: (a) Alteration of the reaction of protein-containing solutions. The concentration of hydrogen ions is lowered in acid solution and that of hydroxyl ions in alkaline solution; (b) neutralization or increase of the electric charge carried by the protein particles, according as the charge on the protein is of opposite or similar sign to that carried by the more potent ion of the salt.

"In the case of egg white agglutination of the denatured protein is assisted by the addition of electrolytes and the range of hydrogen ion concentration over which agglutination occurs is extended. In the case of serum proteins, a similar result is obtained only when salts are present in very low concentration; in presence of more concentrated electrolytes agglutination is hindered if not altogether prevented.

"The cause of dispersion by salts appears to be the absorption of ions by the denatured particles of protein. If the charge of the more potent ion is of opposite sign to their own charge they will, after being first discharged, become recharged with a sign opposite to that they originally carried. The effect is increased with higher valency. Denatured serum protein is easily dispersed by electrolytes, but with egg albumin dispersion accompanied by reversal of charge was detected only after the addition of sodium citrate. In the case of dispersion by divalent cations such as Ca we were not able to demonstrate the existence of any charge on the dispersed particles.

"For every solution containing denatured protein there is a critical temperature, depending on the reaction and on the concentration of protein and electrolytes, below which agglutination does not take place. Immediately above this critical point rise of temperature has at first a very marked effect in enhancing the rate of agglutination; this influence, however, becomes less and less until, at temperatures far removed from the critical temperatures, the effect is consistent, agglutination rate being increased about two to five fold per rise of 10° C. An explanation is suggested.

"No support is found for the conclusion both of Starke and Mill that albumin, when heated in alkaline solution, is converted into globulin; between (a) the dispersed protein and (b) the coherent precipitate obtained on heating in alkaline and faintly acid solutions, respectively, there appears to be no difference which can not be accounted for by the different state of aggregation. Reasons are adduced for regarding the substance studied by these observers as

merely heat-denatured protein obtained in a loose state of aggregation by the method employed."

The lecithin of egg yolk, J. D. RIEDEL (*Abs. in Chem. Zentrbl.*, 1912, I, No. 23, p. 1794; *Jour. Chem. Soc. [London]*, 102 (1912), No. 600, I, p. 744).—A preparation was obtained from egg yolk, free from cholesterol and foreign proteins, by extraction with methyl alcohol. "The formula: $\text{OR}\cdot\text{CH}_2\cdot\text{CR}'(\text{OH})\cdot\text{CH}_2\cdot\text{PO}_3(\text{OH})\cdot\text{C}_2\text{H}_4\cdot\text{NMe}_2\cdot\text{OH}$, is proposed for lecithin, R and R' being aliphatic acyl groups, of which palmitic, stearic, oleic, and linoleic acids have been recognized."

Forms of sugar found in common fruits, F. THOMPSON and A. C. WHITTIER (*Proc. Soc. Hort. Sci.*, 9 (1912), pp. 16-22).—It is pointed out that it is as important to know how much levulose and dextrose is contained in a fruit as the quantity of sucrose present, and the reducing and nonreducing sugars in different varieties of apples, peaches, tomatoes, pears, strawberries, sweet potatoes, bananas, plums, quinces, watermelons, persimmons, and grapes were studied. In some cases the green and ripe fruits were examined. The dominant type of sugars varies with different fruits, and the common practice of expressing the reducing sugars as invert sugar falls far short of the truth in many instances. Invert sugar is a mixture of equal amounts of levulose and dextrose and occurs as such only in the case of the peaches, one of the grapes, bananas, strawberries, and Stone tomatoes and persimmons.

"Levulose is the dominant sugar in apples, pears, quinces, Yellow Pear tomatoes, watermelon, and three of the grapes, and far exceeds the dextrose in the apples, pears, and quinces. With the sweet potato, plum, and one variety of the grape, the dextrose exceeds the levulose, but only in the case of the plum does it far exceed it, and in this case it is lower than the sucrose. One analysis of immature persimmons showed an excess of dextrose over levulose, so it can scarcely be said that dextrose is the principal sugar present in any case. Sucrose is the principal sugar in peaches, plum, and sweet potato."

In 4 out of 5 grapes, 0.5 per cent of sucrose was present in the juices. From the figures, with one exception of the peach, it would seem that the dominant sugar is the first one to appear in the green fruit, and remains in excess until maturity. In the ripe peach, however, the sucrose finally exceeds the percentage of invert sugar. A sample of persimmons ripening in the laboratory showed a complete inversion of the sucrose. "One sample of green grape juice showed no sugar of any kind when analyzed by the optical method, but gave 0.76 per cent of invert sugar by the copper reduction method. Twenty days later the juice of grapes from the same vine gave 0.64 per cent by the optical method and 1.2 per cent by the reduction method. It is evident from these results that grape juice contains reducing substances other than levulose or dextrose which are not removed by the ordinary process of clarification and [this] emphasizes the need of other methods for the determination of these sugars."

The plant alkaloids, T. A. HENRY (*Philadelphia*, 1913, pp. VII+466).—This is a description of plant alkaloids, not only as to the properties and chemistry of these products but also as to their occurrence, methods of estimation, and physiological action. The various alkaloids are considered by groups, and an appendix presents recent work on alkaloids.

The amount of nicotin in the tobacco plant, E. CHUARD and R. MELLET (*Schweiz. Wchnschr. Chem. u. Pharm.*, 50 (1912), No. 31, pp. 470-474).—After pointing out the increasing importance of the tobacco plant as a source of nicotin for insecticidal purposes, the results of an investigation in regard to the amount of nicotin present during the various stages of growth are given.

The ethereal oils of the wood of the spruce, P. KLASON and B. SEGERFELT (*Ark. Kemi, Min. och Geol.*, 4 (1912), No. 3, Art. 20, pp. 1-3; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 600, I, p. 788).—It was noted in the manufacture of alcohol by the sulphite-cellulose process that a reddish-brown oil having a peculiar odor usually collects in the middle of the fractionating tower. If this oil is distilled in a current of steam, a white substance having an odor similar to camphor collects in the condenser. It has a composition corresponding with the formula $C_{10}H_{17}.OH$, a melting point of $207^{\circ} C.$, and is optically inactive. "The properties point to it being borneol, but whether it is a mixture of borneol and isoborneol awaits further investigation. No definite conclusions can yet be drawn as to the condition in which the borneol existed in the original spruce wood, since it would probably be affected by the fermentation process." The bornyl is probably present as an acetate, which was saponified by boiling with the sulphite.

Catalysis, GERTRUDE WOKER (*Die Katalyse. Stuttgart, 1910, pp. 645*).—This work deals with catalysis as applied to analytical, physiological, and technical chemistry. Among its contents are noted the theories of catalysis, its definition and laws, associated phenomena, negative catalysis, physical factors, catalysis and reversibility, etc. A special part is to follow.

The determination of the activity of commercial rennet preparations, W. VAN DAM (*Landw. Vers. Stat.*, 78 (1912), No. 1-2, pp. 133-163; *Rev. Gén. Lait*, 9 (1912), Nos. 9, pp. 193-201; 10, pp. 217-226; 11, pp. 256-261; 12, pp. 267-277).—It was found when setting the titer for normal rennet that the errors were very great (up to 5.9 per cent), consequently the Devarda method used at the present time must be considered entirely unsatisfactory. This led the author to determine if it were possible to obtain a standard which was easily reproducible.

Previous investigations (E. S. R., 28, p. 407) in regard to the enzymes of rennet have shown that the digestion of paracasein at low hydrogen ion concentration (about 1×10^{-5}) proceeds nearly parallel with the coagulation. In the present investigations with 7 different commercial rennet powders it was found, with one exception, which was a badly prepared rennet, that a complete parallelism for coagulation and digestion (2.37×10^{-5} n. H.) was present. Still greater accuracy was noted with preparations obtained from 7 calves' stomachs according to Hammarsten's method. The latter figures not only agreed among themselves but also with the figures for commercial rennet.

On the basis of these findings, a method was elaborated with which it is possible to determine the strength of a standard rennet in any locality and at the same time allow for a reproduction of the standard at any time. With the standard rennet powder (which still shows an error of 3 per cent) used in the laboratory of the experiment station at Hoorn, it was found that a rennet showing a coagulation in dilution of 1:100,000, gives a digestive figure of 26.5, representing the number of cubic centimeters of decinormal acid neutralized by the ammonia obtained as a result of digesting 75 cc. of the product of digestion according to Kjeldahl's method. This is used as the unit of strength for the coagulative power.

In what way is tartaric acid attacked by yeast? L. KARZAG (*Biochem. Ztschr.*, 43 (1912), No. 1-2, pp. 44-46; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 600, II, p. 973).—Among the products resulting from the chemical changes brought about by yeasts are propionic, butyric, lactic, and succinic acids. A scheme is presented which shows how these acids are derived from tartaric acid, and the author assumes that the chief process going on in such fermentations is one of reduction.

The mechanism of the arrest of diastatic activity by filtration, M. HOLLERER (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 4, pp. 318, 319).—In some previous work it was shown that if a solution of diastase was filtered through a Chamberland bougie F a filtrate was obtained which was active if the diastase solution was rendered alkaline before filtration. On the other hand, solutions neutral or acid to methyl orange yielded inactive filtrates.

It has now been found that if white of egg or peptone is added to the diastase solution before filtering, almost all of the diastase goes through the filter even when it is in an acid solution. If the albumin, etc., is passed through the filter before the diastase solution, the same result is obtained.

The mechanism of the process can probably be explained by a fixation of the albumin on the porcelain of the filter.

The saccharification of malt by its own diastase, H. VAN LAER (*Bul. Soc. Chim. Belg.*, 26 (1912), No. 5, pp. 223–226).—The diastase present in malt was found to act directly upon the starch in accordance with Ostwald's definition of a catalyzer.

Action of emulsin on gentiopierin in solution in neutral organic liquids, E. BOURQUELOT and M. BRIDEL (*Compt. Rend. Acad. Sci. [Paris]*, 154 (1912), No. 19, pp. 1259–1261; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 597, I, p. 593).—The decomposition of gentiopierin or salicin by emulsin takes place by simple contact because the hydrolysis goes on in a solution in which emulsin is insoluble. It is shown, however, that gentiopierin is not hydrolyzed by emulsin suspended in dry acetone, but that the hydrolysis may take place slowly in an acetone containing 10 per cent of water. The amount of hydrolysis increases as the water is increased, and is complete in 37 days when 40 per cent of water is added. Similarly, no hydrolysis takes place in a dry solution of ethyl acetate. "Hydrolysis also takes place when solutions made by macerating emulsin in acetone containing at least 50 per cent of water are used, but not with liquids prepared by macerating emulsin in wet ethyl acetate."

A synthetic action of emulsin, E. BOURQUELOT and M. BRIDEL (*Compt. Rend. Acad. Sci. [Paris]*, 154 (1912), No. 21, pp. 1375–1378; *Jour. Pharm. et Chim.*, 7. ser., 5 (1912), No. 12, pp. 569–573; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 597, I, p. 592).—With the object of demonstrating the synthetic action of enzymes, the authors have submitted an alcoholic solution of dextrose and saligenin to the action of emulsin. The course of the action was followed by means of the polarimeter, the final readings of which corresponded with that deduced for the quantity of salicin expected. Attempts to isolate salicin from the reaction product were unsuccessful. In its place a noncrystalline substance, $[\alpha]_D -30.02^\circ$, was obtained, which scarcely reduced Fehling's solution, and was rapidly hydrolyzed by emulsin. It is possibly β -ethyl glucosid."

New synthesis of glucosid alcohols with the aid of emulsin, E. BOURQUELOT and M. BRIDEL (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 7, pp. 437–439).—This continuation of the above work deals with the synthesis of β -butyl glucosid, β -isobutyl glucosid, and β -allyl glucosid.

Reversibility of enzym action.—Influence of the dilution of ethyl alcohol on the synthetic action of emulsin in this medium, E. BOURQUELOT and M. BRIDEL (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 4, pp. 319–322; *abs. in Jour. Soc. Chem. Indus.*, 31 (1912), No. 16, p. 800; *Jour. Chem. Soc. [London]*, 102 (1912), No. 601, I, p. 928).—Experiments were made with mixtures of equivalent amounts of β -ethyl glucosid and dextrose with 85 per cent alcohol in separate flasks. To each of the mixtures there was added the same amount

of emulsin, and they were kept at room temperature for from 16 to 21 days amid occasional shaking. After this period both mixtures were found to have exactly the same rotation. If the strength of the alcohol was varied, the actual final rotation was found to vary accordingly, the greater the alcohol dilution, the greater being the hydrolysis.

The results obtained are regarded as confirming the true reversibility of enzym action.

The supposed reversibility of the hydrolysis of salicin by enzymes, G. BERTRAND and A. COMPTON (*Compt. Rend. Acad. Sci. [Paris]*, 154 (1912), No. 24, pp. 1646-1648; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 597. I, pp. 592, 593).—The proofs given for the reversible nature of emulsin for salicin are not regarded as adequate. In a series of experiments carefully controlled, in which the reducing effect of the dextrose formed was noted, it was found that salicin in 1 and 3 per cent solutions at various temperatures is completely hydrolyzed in a comparatively short time. Even when a little salicin is introduced into equimolecular quantities of the products of hydrolysis (dextrose and saligenin), the addition of emulsin caused hydrolysis of the salicin.

Analytical chemistry, F. P. TREADWELL, trans. by W. T. HALL (*New York and London*, vol. 1, 1913, 3. ed., rev. and enl., pp. XIII+534, pl. 1, figs. 25; vol. 2, 1911, pp. XI+903, pl. 1, figs. 129).—These editions have been compared with the fifth German edition, and deal with qualitative and quantitative analysis. "A new chart of the more important spectra is given [in the first volume], and the wave lengths of the different rays of light stated. Oxidation and reduction equations are explained more on the basis of the electron conception of valence than in accordance with the old dualistic theory, and in this, as well as in other points, the translation does not follow the German text."

The examination of waters and water supplies, J. C. THRESH (*Philadelphia*, 1913, 2. ed., pp. XX+644, pls. 37, figs. 16).—In this second edition (E. S. R., 16, p. 844) the various sections of the book have been amplified, one or two have been entirely rewritten, and two others added, as well as a few more plates on deposits found in water. Bacteriological standards are discussed at length in chapter 10.

Food analysis, H. BAUER (*Nahrungsmittelchemisches Praktikum. Stuttgart*, 1911, pp. VIII+252, figs. 36).—This is an introduction to the physical and chemical methods used in the examination of foods and condiments, these being concisely described.

Yearly report in regard to the progress made in the examination of foods and condiments for 1911, H. BECKURTS, H. FRERICHS, and H. EMDE (*Jahresber. Untersuch. Nahr. u. Genussmitt.*, 21 (1911), pp. 195).—This continues previous reports (E. S. R., 27, p. 310).

An improved method of crude fiber estimation, E. B. FORBES and J. E. MENSCHING (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 3, p. 258).—This is an improvement of the M. P. Sweeney modification of the official method (E. S. R., 28, p. 206), as follows:

"To a 1- or 2-gm. sample, add 200 cc. of boiling 1.25 per cent sulphuric acid, and boil for 30 minutes. Neutralize with 10 per cent sodium hydrate, using phenolphthalein as an indicator; add 200 cc. of 2.656 per cent boiling sodium hydrate; make volume up to 425 cc. and boil for 30 minutes. Filter through a porcelain Gooch crucible containing an asbestos pad and 10 to 12 gm. ($\frac{1}{2}$ in.) of very fine acid-washed sand, compacted by water and suction. Treat with hydrochloric acid; wash with hot water until free from chlorids, and then with alcohol and ether; dry, weigh, ignite, and weigh. . . . Coarse sand was found not to be useful, the reason being that it allows the fiber to pass through and then to clog the asbestos pad.

"The improved method usually gives higher figures than the official method. In general the results check, one with another, more satisfactorily, and the method is very much easier to use."

Tests were made with cowpeas, linseed meal, corn meal, soy beans, distillers' grains (corn), oats, wheat bran, wheat grain, patent flour, gluten feed, and cotton-seed meal.

A rapid control method for the determination of oil in grains, E. P. HARDING and LILLIAN L. NYE (*Jour. Indus. and Engin. Chem.*, 4 (1912), No. 12, pp. 895-897).—The method consists of extracting the grains with carbon tetrachlorid (boiling point 76° C.), cooling the mass, mixing with absolute alcohol, distilled water, and distilled petroleum ether (boiling point 53 to 68°), and then shaking thoroughly; it is then whirled in a centrifuge, the oil blown off, filtered into a tared flask, and dried to constant weight on a water bath. The time required for the entire operation is 3 hours.

"The apparatus used is a thick-walled glass cylinder, $7\frac{1}{2}$ in. long and $1\frac{1}{4}$ in. in diameter, a water bath, a reflux condenser, a condensing tube, a centrifuge, a blow-off tube similar to that used with a Werner-Schmidt apparatus, a Soxhlet extractor provided with a glass stopcock connected to a reflux condenser, a receiver, a casserole 5 in. in diameter, a flask $2\frac{1}{2}$ in. bottom diameter by 4 in. in height, and a small funnel."

A rapid and accurate gravimetric method for determining milk fat in evaporated milk and milk powders, E. P. HARDING and G. PARKIN (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 2, pp. 131-134).—Various modifications of the Babcock method which have been suggested as giving reliable results with condensed milk products were tried, special emphasis being given to the modifications of Leach (E. S. R., 12, p. 823), and of Hunziker and Spitzer (E. S. R., 21, p. 412). These methods not only gave too low results but also an impure fat and a fat column very difficult to read. Of the gravimetric methods in use, the Werner-Schmidt method and Röse-Gottlieb methods gave the most reliable results, although not absolutely correct in every case.

"The direct extraction methods like Adams' paper coil method [E. S. R., 20, p. 512] and its modifications [E. S. R., 21, p. 412] are impracticable, being too long and giving either too low results or an impure fat." The method which is recommended is a modification of the Harding-Nye method (see abstract above). "The principle of the method is the breaking down of the emulsion by dissolving all protein in acetic acid, the solution of the fat in a mixture of alcohol and carbon tetrachlorid, and its extraction with petroleum ether. The reagents used are acetic acid, 25 per cent by volume, redistilled carbon tetrachlorid, 95 per cent ethyl alcohol, and petroleum ether with boiling point between 50° and 70° C.

"The apparatus used are a mortar and pestle for macerating the can's contents, an evaporating dish of about 50 cc. capacity for weighing out the sample, a 100 cc. flask for making up the 40 per cent emulsion, a 10 cc. graduated pipette, a 100 cc. Nessler jar fitted with 2 rubber stoppers, 1 unperforated and used while centrifuging, the other doubly perforated, bearing blow-off tubes similar to the Werner-Schmidt blow-off tube, a centrifuge, a 7 cm. filter paper, funnel and stand, wide-mouthed flasks of 50 to 75 cc. capacity for weighing the fat, a small evaporating dish for holding wash petroleum, a petroleum ether wash bottle, a condenser, and drying oven."

The results obtained by the method are compared with those given by the Röse-Gottlieb, the Hortvet modification of the Röse-Gottlieb method for condensed milk, and the West^a and modified Babcock method for ice cream.

^a Bien. Rpt. Minn. State Dairy and Food Comr., 12 (1907-8), p. 292.

Catalase in butter, HESSE (*Molk. Ztg. [Hildesheim]*, 26 (1912), No. 6, pp. 81-84).—This is a study of butters sent to the laboratory for examination and judgment in regard to quality. The tests made were for water content, degree of acidity, and catalase figure.

For the catalase figure Henkel's apparatus (E. S. R., 22, p. 710) was used. The procedure was as follows: One hundred gm. of butter was melted at 45° C. and mixed with 40 cc. of water of the same temperature. After allowing the mixture to stand for a time, 15 cc. of the watery fluid (buttermilk fluid) was examined for catalytic activity. Certain errors in the method are pointed out, but the results obtained, which are low, may be so calculated as to correspond with buttermilk or normal milk.

Some tests with mixtures of foreign fats with butter are included.

The fatty acids of butter, IDA SMEDLEY (*Biochem. Jour.*, 6 (1912), No. 4, pp. 451-461, figs. 2).—It is pointed out that, in spite of the large number of analyses of butter reported, considerable uncertainty still remains as to the constitution of the fatty acids contained in butter. For instance, no work on the constitution of hexoic (caproic) acid seems to have been carried out since 1823; therefore, among other things it seemed desirable to settle quite definitely the structure of hexoic acid present in butter.

The work is summarized as follows: "No evidence of the presence of acetic acid was found in the butter examined. The hexoic (caproic) acid present in butter possesses the normal structure; no indication of the presence of the isohexoic acid was obtained. It seems probable that of all the naturally existing specimens of caproic acid which have been described, only that occurring in the bacterial decomposition of proteins has a branched structure. The proportion of stearic acid was estimated as from 10 to 15 per cent. Evidence was obtained of the existence of lower members of the oleic acid series; the iodine value of the decolic ester fraction is appreciably greater than those of the fractions immediately preceding or following it. This may be regarded as indicating the presence of a lower unsaturated acid, possibly of a decylenic acid.

"The sodium-nitroprussid reaction, characteristic of aceto-acetic acid and of acetone, was given by the butyric ester fraction obtained from 2 out of 5 samples of butter, esterified by sodium methylate at ordinary temperature; the remaining 3 samples gave negative results. The reaction may possibly have owed its origin to the products of bacterial action; it was observed in 2 cases where Haller's acid method of esterification had been used."

A new method for the determination of total nitrogen in urine, O. FOLIN and J. C. FARMER (*Jour. Biol. Chem.*, 11 (1912), No. 5, pp. 493-501, figs. 2; *abs. in Zentbl. Expt. Med.*, 2 (1912), No. 14, pp. 637, 638).—As a substitute for the Kjeldahl method for determining the total nitrogen in urine, a micro-chemical method is proposed which is based on the Kjeldahl decomposition process and the Nessler and Folin method of determining ammonia, is as follows:

Five cc. of the urine is measured with an Ostwald pipette into a 50-cc. measuring flask; where the specific gravity is lower than 1.018, only 25 cc. solution of urine is used. The bottles are then filled to the mark with distilled water, and 1 cc. of the diluted urine is brought into a large test tube, to which are added 1 cc. of concentrated sulphuric acid, 1 gm. of potassium sulphate, 1 drop of a 5 per cent copper sulphate solution, and a sliver of glass. The solution is then boiled for 6 minutes over a micro-burner, allowed to cool for about 3 minutes until the contents of the test tube begin to congeal, and then 6 cc. of water and 3 cc. of a saturated sodium hydroxid solution are added. The ammonia, which is liberated, is then removed with the aid of a suction pump and absorbed in a solution consisting of 20 cc. of water and 2 cc. of decinormal

hydrochloric acid. During the first 2 minutes the suction must be conducted cautiously, because strong suction is required for the succeeding 8 minutes.

The solution containing the absorbed ammonia is diluted to about 60 cc., to which is added 5 cc. of diluted Nessler solution (5 cc. plus 25 cc. of water). As a control a solution containing 1 mg. of pure ammonium sulphate in about 60 cc. of water and contained in a Nessler tube is used. Both solutions are then filled up to the 100-cc. mark and compared in a Duboscq colorimeter. The ammonia can also be determined by titration, using alizarin red as an indicator.

The distribution of amygdalin, L. ROSENTHALER (*Arch. Pharm.*, 250 (1912), pp. 298-301).—For the purpose of finding out whether amygdalin from various sources (apricot, peach, plum, cherry, apple, and quince) was stereo-isomeric, the melting point, specific rotation, molecular weight, percentage of nitrogen, and the rotation of the mandelic acid obtained by hydrolysis of the amygdalin were determined. They were found identical with the amygdalin obtained from the bitter almond.

It is also pointed out that in Bourquelot's method the changes produced by emulsin are noted with the polariscope after clearing the solution with lead subacetate. It is claimed that correct results can only be obtained with such a method when the emulsin solution has been rendered optically inactive by the clarification process. This was found not to be the case with the emulsin solutions clarified with the lead subacetate process, and a left-hand rotation was obtained.

Choice of yeasts in the biochemical detection of sugars and glucosids, E. BOURQUELOT and H. HÉRISSEY (*Jour. Pharm. et Chim.*, 7. ser., 6 (1912), No. 6, pp. 246-253; abs. in *Jour. Chem. Soc. [London]*, 102 (1912), No. 601, II, p. 110 $\frac{1}{2}$).—In reply to the abstract above, it is pointed out that the enzym which attacks amygdalin and produces mandelonitrile glucosid is amygdalase and not invertase. The second factor mentioned by Rosenthaler, that emulsin preparations are often levorotatory, has not been noted, but if such is the case, allowance can easily be made for it in the calculation.

In regard to the technical-scientific work in potato drying, E. PAROW (*Abs. in Ztschr. Angew. Chem.*, 25 (1912), No. 16, pp. 777-779).—This is a summary of the work conducted in the laboratories of the Society of German Potato Driers. It includes reports on the comparative analyses of potato chips, flakes, and meal, which show that there is only a little difference in their composition. The results of some tests of machinery installed in potato-drying factories are discussed, as well as some new drying apparatus and the yields.

Conducting fermentation processes in breweries, distilleries and yeast factories, M. DELBRÜCK and F. HAYDUCK (*Die Gärungsführung in Brauerei, Brennerei und Prefshefefabrik. Berlin, 1911, pp. X+225, figs. 6*).—This book is based upon the work and results obtained at the Institute for the Fermentation Industry at Berlin, Germany.

METEOROLOGY—WATER.

Agricultural meteorological contributions (*Trudy Selsk. Khoz. Met.*, 1912, No. 10, pp. II+173, figs. 5).—This number of the contributions from the Meteorological Bureau of the Scientific Committee of the Ministry of Agriculture of Russia contains, among others, the following articles (in the Russian language): The Dependence of the Yield of Oats on the More Important Meteorological Conditions During 1908 and 1909, by A. P. Chernyi; Meteorological Conditions Affecting the Growth of Oats, by M. A. Evstifeeva; and Instructions for Carrying on Agricultural Meteorological Observations at Garden and Tobacco Stations, by V. O. Askinazi.

Annals of agricultural meteorology, edited by P. I. BROUNOV (*Met. Biuró [Russia], Lëtopisi Sclsk. Khoz. Met.*, 1 (1908-9), Nos. 1, pp. X+33; 2, pp. VII+52; 3, pp. IV+19).—This volume (which is published in the Russian language) is divided into three parts dealing, respectively, with meteorology as related to the growth of (1) winter cereals (rye and wheat); (2) summer cereals (oats, barley, wheat, millet, and maize); and (3) fruits (apples, pears, apricots, cherries, gooseberries, and grapes).

The organization of a general service for agricultural meteorology, P. REY (*Bul. Mét. Dept. Hérault*, 39 (1911), pp. 79-92).—The plan proposed for the organization of an agricultural meteorological service in France is described.

Agricultural meteorology, P. POSKIN (*Ciel et Terre*, 33 (1912), No. 12, pp. 388-393).—This is a brief account of the plan proposed by a special committee for the organization of an agricultural meteorological service in France.

International catalogue of scientific literature. F—Meteorology (*Internat. Cat. Sci. Lit.*, 10 (1913), pp. VIII+224).—This is the tenth annual issue of this catalogue. The literature indexed in it "is mainly that of 1910 but includes those portions of the literature of 1901-1909 in regard to which the index slips were received by the Central Bureau too late for inclusion in the previous volumes. There are also entries dated 1911."

Monthly Weather Review (*Mo. Weather Rev.*, 41 (1913), Nos. 3, pp. 327-502, pls. 11, fig. 1; 4, pp. 503-661, pls. 10, figs. 4).—In addition to the usual climatological summaries, lake levels, weather forecasts and warnings for March and April, 1913, river and flood observations, lists of additions to the Weather Bureau library and of recent papers on meteorology, a condensed climatological summary, and climatological tables and charts, these numbers contain the following special papers:

No. 3.—Severe Local Storms [South Atlantic and East Gulf States]; The Sleet Storm in Northern New York, March 25-27, by W. J. Bennett; Tornado in Southern Illinois, by F. H. Colyer; Storms in Illinois—March, 1913, by C. J. Root; Storm of March 23, 1913, at Davenport, Iowa, by J. M. Sherier; Tornado of March 23, 1913, at Omaha, Nebr. (illus.), by L. A. Welsh and A. R. Schmitt; Severe Local Storms, Louisiana, by I. M. Cline; Tornadoes in Arkansas, March, 1913, by H. F. Alciatore; Severe Storms in Western Tennessee, by S. C. Emery; Electrical Storm of March 23 in Kansas, by S. D. Flora; Measuring the Snow Layer in Maple Creek Canyon, Utah, by A. H. Thiessen and J. C. Alter; Snow Survey in the Walker Drainage Basin, Nevada, by H. S. Cole; Notes on the Rivers of the Sacramento and Lower San Joaquin Watersheds during the Month of March, 1913, by N. R. Taylor; Notes on the Streams of the Upper San Joaquin Watershed, by W. E. Bonnett; The Season's Snowfall, and Snowfall Conditions in the Mountains at the Headwaters of the Columbia River and Its Tributaries at the End of March, 1913; and Tornado at Terre Haute, Ind., March 23, 1913.

No. 4.—Report on the Flood in the Tombigbee and Black Warrior Rivers in Alabama during January to March, 1913, by A. Ashenberger; Report on Floods Occurring or in Progress in the Cairo, Ill., District during the Month of April, 1913, by R. T. Lindley; Iowa-Nebraska Tornadoes of March 23, 1913 (illus.), by G. A. Loveland; Destructive Rainstorm of April 8-9, 1913, in Arkansas, by H. F. Alciatore; Effect of Dust on the Melting of Snow, by H. A. Jones; Cloud-shadow Projection, by H. H. Martin; Damage by Frost in Western Colorado, by E. S. Nichols; Notes on the Rivers of the Sacramento and Lower San Joaquin Watersheds during April, 1913, by N. R. Taylor; Notes on Streams of the Upper San Joaquin Watershed, by W. E. Bonnett; Frost Studies—Determining Probable Minimum Temperatures, by A. G. McAdie (see p. 511); and The Rainfall of Berkeley, Cal. (illus.), by W. G. Reed (see p. 511).

Frost studies.—Determining probable minimum temperatures, A. G. MCADIE (*Mo. Weather Rev.*, 41 (1913), No. 4, pp. 623-625).—Observations are briefly cited which indicate "that in future studies concerning the best methods of frost protection special attention must be given to the moisture content of the air. This factor seems to play a controlling part in determining minimum temperatures. Not only this, but it is of great importance in connection with the maintenance of proper plant functions, especially in connection with transpiration."

The rainfall of Berkeley, Cal., W. G. REED (*Univ. Cal. Pubs., Geogr.*, 1 (1913), No. 2, pp. 63-79, pl. 1, figs. 6; *abs. in Mo. Weather Rev.*, 41 (1913), No. 4, pp. 625-627, figs. 3).—This is a record of 25 years' observations at the University of California in cooperation with the U. S. Weather Bureau. The results are recorded for a rainfall year from July 1 to June 30 rather than for the calendar year, "as the rains at Berkeley are of the type known as subtropical, dry summers and winter rains under cyclonic control, so that the autumn rains should be grouped with those of the winter and spring of the following and not of the same calendar year."

The mean precipitation for this rainfall year is 26.6 in. but varies widely for individual years. "The greater part of the rains occur between the beginning of November and the end of March, but rains are not uncommon except in July and August, which months are usually dry. . . . The record fails to show any progressive change in the amount of precipitation."

Surface water supply of North Pacific coast, 1910, F. F. HENSHAW, E. C. LARUE, and G. C. STEVENS (*U. S. Geol. Survey, Water-Supply Paper 292, 1913, pp. 685, pls. 3*).—This paper contains a description of the river basins of the North Pacific coast and the results of stream measurements in them, namely, gage-height records, results of current-meter measurements, and daily and monthly discharges.

Surface water supply of Hudson Bay and upper Mississippi River, 1911, R. FOLLANSBEE, A. H. HORTON, and H. J. JACKSON (*U. S. Geol. Survey, Water-Supply Paper 305, 1913, pp. 197, pls. 4, figs. 2*).—This paper presents briefly the results of measurements of flow made in streams in the drainage basins named during the calendar year 1911, including tables giving gage heights and daily and monthly discharges at each station.

Surface water supply of western Gulf of Mexico, 1911, W. W. FOLLETT, W. B. FREEMAN, and G. K. LARRISON (*U. S. Geol. Survey, Water-Supply Paper 308, 1913, pp. 117, pls. 4*).—This is a report on the results of measurements of the flow of streams in this drainage basin, made during the year 1911, including tables giving gage heights and daily and monthly discharges at each station.

Water resources of Hawaii, 1909-1911, W. F. MARTIN and C. H. PIERCE (*U. S. Geol. Survey, Water-Supply Paper 318, 1913, pp. 552, pls. 15, figs. 4*).—This volume contains results of measurements of the flow of certain streams and ditches in the Territory of Hawaii made during the period 1909 to 1911, inclusive, rainfall and evaporation records, an account of the factors that affect the flow, and a brief summary of the general conditions influencing the economic development and use of the surface waters. It also contains an appendix comprising notes on the pronunciation and meaning of Hawaiian geographic names and a gazetteer.

The underground water resources of the coastal plain province of Virginia, S. SANFORD (*Va. Geol. Survey Bul. 5, 1913, pp. XV+361, pls. 3, figs. 7*).—This report deals with an area of about 9,500 square miles, corresponding roughly with what is known as Tidewater Virginia. It "covers the occurrence and character of both shallow and deep waters, the geological relations of water beds, extent of artesian horizons and areas in which flowing wells can be had,

methods and costs of developing underground water supplies, special adaptability of waters for domestic or medicinal use and their application in agricultural and other industries, the relation of well and spring waters to the public health with particular reference to water-borne diseases."

It is shown that plenty of water is to be had in this area and, except in a limited district in the southeastern and eastern part of the region, artesian supplies of abundant flow and excellently adapted for domestic purposes can be obtained without difficulty. "Dug wells are so cheaply sunk that they have become the main source of domestic supply. Many such wells from their location and the insufficient precaution against the entrance of water contaminated by organic wastes may frequently become dangerous to the public health. But dug wells properly located and protected will, in many places, yield entirely satisfactory supplies. The deposits underlying the terraces on which stand many of the towns and villages of the coastal plain transmit water readily, hence springs issuing from such terraces or shallow wells in the villages are easily polluted by filth from vault privies and from cesspools. The mineral content of the well and spring waters varies greatly at different localities, or even in the same locality, hence both the deep and the shallow waters are variously suitable for domestic uses, boiler supply, or particular industries. The most striking characteristic of the artesian waters of certain formations on the west side of Chesapeake Bay is their relatively large content of sodium bicarbonate. In this aspect they differ from many deep waters."

The investigations reported in this bulletin were made under a cooperative agreement between the Virginia Geological Survey and the U. S. Geological Survey.

Sewage pollution of interstate and international waters, with special reference to the spread of typhoid fever.—VI, The Missouri River from Sioux City to its mouth, A. J. McLAUGHLIN (*Pub. Health Serv. U. S., Hyg. Lab. Bul. 89, 1913, pp. 84, pls. 4, figs. 20*).—This report states that sewage pollution of the lower Missouri River is generally from Sioux City to its mouth, being most pronounced in the vicinity of cities and packing plants, that there has been an undue prevalence of typhoid fever for years in every city taking its water supply from the Missouri River except St. Joseph, and that St. Joseph had high rates in 1910 and 1911. This necessitates a high degree of purification in order to make Missouri River water safe. Filtration alone is not adequate. The use of hypochlorite of lime in addition has given good results in many cases.

Chlorid of lime in sanitation, A. H. HOOKER (*New York and London, 1913, pp. V+231*).—This is a compilation of data relating to the uses of chlorid of lime in sanitation, including among others water purification and sewage disinfection. It consists of a general review of the subject and a series of annotated references to literature.

SOILS—FERTILIZERS.

The value of soil analyses to the farmer, A. D. HALL (*Jour. Roy. Agr. Soc. England, 73 (1912), pp. 1-9*).—The author summarizes the present position of soil analysis as follows:

"Mechanical analysis enables us to classify soils and assign an unknown example to its type. From the type, combined with knowledge of the situation and climate, we may predict its suitability or otherwise for particular crops. Chemical analysis will tell us whether a soil is getting acid or needs liming to make it work properly and utilize the manure supplied to it. From chemical analysis we can settle what class of manures ought to be used, whether sul-

phate of ammonia or nitrate of soda, superphosphate or basic slag. Chemical analysis will often reveal particular deficiencies and the specific [need] for phosphates or potash, but to do this with any certainty the composition and behavior of soils of that type should be known from a previous soil survey."

Soils of the Hartford quadrangle, S. C. JONES (*Ky. Geol. Survey Bul. 20, 1912, pp. 26-33*).—The typical soils of this area, which lies wholly within Ohio County, are briefly described. Of the 247 square miles included in the area 172.19 square miles contain residual soils and 74.81 square miles transported soils. Five types are recognized—yellow silt loam (hilly and undulating), yellowish gray silt loam (bottom), gray silt loam (river bottom), and yellow clay loam (river bottom). More than half of the area is covered with hilly yellow silt loam soils. These wash badly and are under cultivation to a very limited extent. The work on these soils was done in cooperation with the state experiment station.

A botanical cross section of northern Mississippi, with notes on the influence of soil on vegetation, R. M. HARPER (*Bul. Torrey Bot. Club, 40 (1913), No. 8, pp. 377-399, pls. 2*).—It is stated that the correlations between geology and vegetation are more obvious in Mississippi "than in any other part of the coastal plain, unless it is in western Alabama." Studying more particularly the relation of the growth of evergreens to the composition of soils, it was found "that in the regions under consideration the evergreens can be correlated with potash just about as well as with lime, evergreens being scarcest in the soils richest in potash. This relation is still more apparent when we compare northern Mississippi, where nearly all the soils are pretty well supplied with potash, with Florida, where soil conditions are very different. Florida has a larger proportion of evergreens than any other State in the Union, and at the same time its soils are poorest in potash, though fairly well supplied with lime."

Economic products of the Virginia coastal plain, T. L. WATSON (*Va. Geol. Survey Bul. 4, 1912, pp. 223-272, pls. 3*).—This is a brief discussion of clays, sand and gravel, diatomaceous earth, greensand marl, calcareous (shell) marl, mineral paint, iron ore, building stone, peat soils, and underground waters occurring in this region. It is stated that some of the deposits of these materials are of very considerable economic value. Some of them have been and are still being utilized, while others have scarcely commenced to be developed.

"The deposits of clay, sand and gravel, diatomaceous earth, calcareous (shell) and greensand marls are very extensive and are generally of good grade. The extensive deposits of calcareous (shell) marl and clay, located directly on deep tidewater, offer large possibilities in the location of plants for the manufacture of Portland cement."

Analyses of the greensand marls are reported and their use for fertilizing purposes is briefly discussed.

The salt marshes of the north coast of Porto Rico, F. W. ZERBAN (*Porto Rico Sugar Producers' Sta. Bul. 4 [English Ed.], 1913, pp. 42*).—A study of the chemical composition of these soils, a brief account of which has already been referred to (*E. S. R., 29, p. 17*), is reported in detail in this bulletin with a discussion of the relation of the composition of the soil to the production of sugar cane and to methods of reclamation or improvement. The samples were taken from swamps, which are typical of considerable areas of such soils along the north coast of Porto Rico.

As a rule the humus surface soil typical of such areas rests upon and is more or less mixed with a subsoil of limestone or marl. The surface soil is more or less impregnated with saline matter in which sodium chlorid, mixed with smaller but varying amounts of bicarbonates and sulphates of calcium, mag-

nesium, and potassium, predominates. There was found to be a striking relation between the salt content of the soils and the general condition of the cane grown on them.

The general conclusion from all the results obtained was that, if the ground water is below the reach of cane roots, the sum of bicarbonic acid and chlorin may safely rise to 0.4 per cent. The injurious effect of the chlorids varied inversely with the proportion of sulphates present. Thorough drainage is considered the prime requisite for reclaiming these soils.

The origin, formation, nature, and culture of moors, E. BENZE (*Entstehung, Aufbau und Eigenarten der Moore, sowie ihre Bedeutung für die Kultur, unter besonderer Berücksichtigung der nordwestdeutschen Moorgebiete. Inaug. Diss., Univ. Erlangen, 1911, pp. IX+107*).—The study reported in this doctor's thesis dealt especially with the moor region of northwest Germany, and included not only the origin, distribution, nature, and culture of the moor lands, but also their importance from the scientific, historical, and sociological standpoint. A short section discusses the chemical and physical properties of moor soils in relation to culture, water control, and climate. A list of references to the literature is included.

Soils, H. J. VIFOND (*Union So. Africa Dept. Agr. Rpt. 1910-11, pp. 374-390, 406-411, 418-422*).—Chemical analyses of a large number of samples of soils from different parts of South Africa are reported and discussed with reference to their plant-food content and fertilizer requirement. Especial consideration is also given to the lime-magnesia ratio and the ratio of available to total phosphoric acid in relation to the productiveness of the different soils.

[Usar and regur soils], J. W. LEATHER (*Ann. Rpt. Bd. Sci. Advice India, 1911-12, pp. 24-30*).—This is mainly a review of investigations which have been more fully reported elsewhere. The nature and movement of alkali salts in usar soil and the nature of the coloring matter of regur (black cotton) soils were studied. The alkali as a rule contained sodium carbonate and bicarbonate, usually with smaller amounts of sodium chlorid and sulphate.

The permeability of the soils to water was very slight and therefore the vertical movement of the salts was very slow. The alkali in irrigated land was not different in general character from that of unirrigated soil. The author concludes from his studies of certain regur soils that their dark color is largely due to a cementing material, partly organic, and not to titaniferous magnetite as in cases reported previously by himself and others (*E. S. R.*, 27, p. 823).

Contribution to regional weathering in ancient times, E. BLANCK (*Mitt. Landw. Inst. Breslau, 6 (1913), No. 5, pp. 619-682*).—This article deals more particularly, and in considerable detail, with the geological origin of the red soils.

Warping, J. STEPHENSON (*Jour. Roy. Agr. Soc. England, 73 (1912), pp. 104-113*).—Warping, as practiced in England, is defined, its history is briefly discussed, chemical analyses of the warp deposited by the Trent and Ouse rivers are given, and the methods of warping employed in the regions surrounding the outfalls of the Trent and of the Yorkshire Ouse are described. It is explained that warp is the local name for the earthy particles held in suspension by the tidal waters in the rivers, probably derived from erosion of the coastal rocks, and is not the silt derived from soil erosion. The former has a high fertilizing value, whereas the latter may be a serious detriment when deposited on land.

The influence of various factors of growth, especially water, on the maximum yield in pot experiments, T. PFEIFFER, E. BLANCK, and K. FRISKE (*Landw. Vers. Stat., 82 (1913), No. 3-4, pp. 237-298, figs. 11; abs. in Ztschr. Angew. Chem., 26 (1913), No. 82, Referatenteil, p. 601*).—The details of experi-

ments with seven different kinds of soil extending through two years are reported. Water was applied at four different rates, namely, 30, 50, 70, and 90 per cent of the water capacity of the soils.

It was observed that the ratio of grain to total yield decreased as the water supply increased. The nitrogen content of the crop decreased, while the potash, and especially the phosphoric acid, increased with increase of water supply.

A note on previous observations on the behavior of nitrate in cultivated soil, VOGEL (*Landw. Vers. Stat.*, 82 (1913), No. 1-2, pp. 159, 160; *abs. in Jour. Chem. Soc. [London]*, 10 $\frac{1}{2}$ (1913), No. 609, I, pp. 810-811).—Attention is called to an error in some of the results previously reported (*E. S. R.*, 28, p. 521) which showed very high losses of nitrates. The very high results reported were due in some cases to fixation of nitrates by the porcelain dishes used in the laboratory determinations. There was observed, however, a loss of 10 to 12 per cent of nitrates by denitrification in 4 days when humus soils were exposed to the air in thin layers.

The condition of soil phosphoric acid insoluble in hydrochloric acid, W. H. FRY (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 8, pp. 664, 665).—From the results of tests by others of the official method of extraction with hydrochloric acid of 1.115 specific gravity the author concludes that "there may be a very minute quantity of phosphoric acid in soils in hydrochloric-acid-insoluble compounds, but a large part of the phosphoric acid not extracted is present in a soluble form—that is, as apatite—which is protected from the action of the acid."

A study of bacteria at different depths in some typical Iowa soils, P. E. BROWN (*Centbl. Bakt. [etc.]*, 2. Abt., 37 (1913), No. 17-21, pp. 497-521, pls. 9).—The substance of this article has already been given from another source (*E. S. R.*, 28, p. 627).

The prevalence of *Bacillus radicum* in soil, K. F. KELLERMAN and L. T. LEONARD (*Science, n. ser.*, 38 (1913), No. 968, pp. 95-98).—This is a brief account of an unsuccessful attempt to utilize various synthetic media in determining the relative distribution and quantitative function of *B. radicum* in three different kinds of soil.

The complexity of the micro-organic population of the soil, H. L. BOLLEY (*Science, n. ser.*, 38 (1913), No. 967, pp. 48-50).—This article states that in investigations to ascertain what it is that tends to limit grain production or to cause deteriorated grain on fertile soils the author found "that if we bring about rather perfect sterilization in potted soils, the limiting factor on grain production is done away with, provided we do not reintroduce it by means of internally infected seeds or other wheat disease-producing matters. Bacteria and amœbæ do not seem to play any primary part in this problem of deteriorated cereal crops." He was not able "to find any cereal crop-limiting factors of any importance associated either with indefinite toxic substances or with the activity of bacteria." He did find, however, "that there are at least one or more species each of the following moldlike fungi which, when in the soil, are real cereal crop-limiting factors: *Fusarium*, *Alternaria*, *Helminthosporium*, *Colletotrichum*, *Macrosporium*, and *Ophiobolus*. . . . Most of these organisms are not only persistent in the soil, remaining there by way of the stubble and roots of their host plants, but may be introduced with the seed, fresh or improperly composted manures, etc., most of them being what may be spoken of as internal seed-infecting organisms."

The author emphasizes the necessity of using disease-free seedlings in investigations on the bacterial and toxic phases of the question of soil fertility and briefly reports the results of experiments with such seedlings grown in synthetic

media. Contrary to the conclusions reached by Russell and Hutchinson, he concludes that the amount of ammonification occurring in the soil is not an index of the productiveness of the soil for potatoes, wheat, or flax, and he was unable to find that the amœbæ or their allies are particularly harmful or beneficial as associated with wheat cropping.

Cereal cropping.—Sanitation, a new basis for crop rotation, manuring, tillage, and seed selection, H. L. BOLLEY (*Science, n. ser.*, 38 (1913), No. 973, pp. 249-259).—After discussing briefly the various theories which have been advanced to explain the decline in productiveness of cultivated soils, the author sets forth his own views regarding soil sanitation, especially as applied to the production of cereal crops, maintaining "that sanitary considerations with reference to the characteristics of parasitic diseases which are now quite commonly resident in the seed and the soil will yet form the essential basis for the proper management of crops in rotation in series, and the same considerations will largely govern the type of tillage and the manner of handling waste materials on the farm, particularly farm manures. Further, aside from the matter of variety as to food value, the efforts of agriculturists and agronomists with reference to cereal cropping will, in the future, give primary consideration to the selection of seed for sowing purposes, based directly upon its powers of resistance to disease."

Trials with crops and fertilizers at Swedish moor culture stations, 1912. H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr.*, 27 (1913), No. 4-5, pp. 338-370, figs. 2).—This report of the Swedish Moor Culture Society for 1912 contains accounts of the meteorological conditions, soil temperatures, and variety and fertilizer tests conducted at Jönköping, Flahult, and Torestorp moor during the year.

Cooperative fertilizer trials on Finnish moor soils, 1910-11, E. A. MALM (*Finska Mosskulturför. Årsbok*, 16 (1912), No. 3, pp. 218-236).—These trials were conducted on 17 different farms under the direction of the Finnish Moor Culture Society. The fertilizers applied on the different plats were phosphatic (Thomas slag or bone meal) or potassic (kainit or 37 per cent potash salt), or both.

Fertilizers for moor land, H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr.*, 27 (1913), No. 4, Sup., pp. 73, figs. 43).—This is a popular treatise on the best methods of treatment of moor plantations in order to secure the largest possible yields and most profitable returns. It deals with manure *vs.* artificial fertilizers for moor soils, methods of fertilization and application of fertilizers, purchase of artificial fertilizers, kinds to be used for different crops, etc.

The following is in brief the teaching of the pamphlet (as applied to the Gottland moor soils which contain a high percentage of nitrogen): Without fertilization there is always loss; light fertilization gives no profit, but heavy fertilization gives good profit. One-sided phosphatic fertilization gives little profit and one-sided potash fertilization certain loss, while simultaneous phosphatic and potash fertilization always give good profit.

Cave deposits of fertilizing value, H. J. VIPOND (*Union So. Africa Dept. Agr. Rpt. 1910-11*, pp. 390-392, 423).—Analyses of a number of samples of bat guano and other cave deposits are reported.

Guano Islands, F. B. SMITH and W. R. ZEEDERBERG (*Union So. Africa Dept. Agr. Rpt. 1910-11*, pp. 30, 31, 467-471).—The composition and supply of guano of these islands, situated along the western and southern coast of South Africa, are briefly discussed.

It is shown that the supply, which yielded 7,125 tons in 1911, is not sufficient to meet the local demand. The average composition of the guano, as recently offered for sale, is nitrogen 11.1 per cent; potash 2.35 per cent; phosphoric acid,

soluble in water, 3.1 per cent; phosphoric acid, soluble in citrate solution, 9.19 per cent; total phosphoric acid 10.55 per cent; and lime 10.39 per cent.

Seaweed burning in Norway, W. A. LEONARD (*Daily Cons. and Trade Rpts.* [U. S.], 16 (1913), No. 197, pp. 1102, 1103).—The burning of seaweed on the Norwegian coast for the preparation of ashes which are exported to Scotland to be used in the manufacture of iodine is briefly described. It is stated that during the past 45 years the export from the one port of Stavanger has not been less than 1,500 tons annually.

The American fertilizer handbook, 1913 (Philadelphia, 1913, pp. 352, figs. 25).—This handbook contains as usual directories of fertilizer manufacturers and allied fertilizer trades and of cotton-seed oil mills, as well as special articles, statistics, and miscellaneous information relating to the fertilizer industry. Among the more important special articles included are Fertilizer Materials in the United States, by F. K. Cameron; The Year's Progress in the Fixation of Atmospheric Nitrogen, by T. C. Pinkerton; Sampling of Fertilizers, by J. S. Brogdon; The Sulphuric Acid Industry, by A. M. Fairlie; Fertilizers for Hay and Pastures, by E. B. Voorhees; Cyanamid, by E. J. Franke; Definitions of Fertilizer Materials, by T. C. Pinkerton; and The Revolution in Tennessee Phosphate Mining Practice, by L. P. Brown.

Importance of nitrogenous fertilizers, J. W. TURRENTINE (*Amer. Fert.*, 38 (1913), No. 12, pp. 25-30).—This article discusses briefly the sources, production, and consumption of the principal nitrogenous materials used for fertilizing purposes in the United States, including sodium nitrate, ammonium sulphate, artificial nitrates, calcium cyanamid, tankage, and dried blood.

The nitrate fields of Chile, W. S. TOWER (*Pop. Sci. Mo.*, 83 (1913), No. 3, pp. 209-230, figs. 17).—This is a popular account of the location, extent, methods of exploitation, and commercial possibilities of these fields.

It is stated that "most estimates of the available supplies of nitrate range between about 70,000,000 and 100,000,000 tons, which at the present rate of production would insure the life of the industry for 35 to 40 years. Some estimates, however, place the amount as high as 200,000,000 tons. . . . The smaller estimates make little or no allowance for discoveries of new nitrate deposits, which is quite likely to happen, nor do they count on any improvements in processes of manufacture, which very readily might prolong by many years the duration of supplies now known. It also is possible that ripio, nitrate-bearing costra, and low-grade caliche, thrown aside in the past, may be worked profitably in the future. Should all these things develop favorably the nitrate industry could thrive for a good many decades to come. Otherwise its span of existence is not likely to extend much beyond the middle of the century, for increased production, which is entirely probable, must hasten the end."

The Ostwald process for making nitric acid from ammonia (*Sci. Amer. Sup.*, 76 (1913), No. 1967, pp. 162, 163, figs. 4).—This process, which is based upon the fact discovered by Kuhlmann in 1830 that ammonia is oxidized to nitric acid in the presence of atmospheric oxygen by the catalytic action of platinum, is described and its commercial possibilities when used in combination with the manufacture of calcium cyanamid are discussed, the latter product being used to furnish the ammonia required for the production of nitric acid.

The fixation of ammoniacal nitrogen by permutite and clay soils and the assimilation of permutite nitrogen by plants, D. J. HISSINK (*Landw. Vers. Stat.*, 81 (1913), No. 3-6, pp. 377-432, pl. 1, figs. 5; *abs. in Chem. Abs.*, 7 (1913), No. 20, pp. 3523, 3524; *Jour. Chem. Soc. [London]*, 104 (1913), No. 609, I, p. 811).—Another account of the investigations here reported has been noted elsewhere (*E. S. R.*, 29, p. 127).

The assimilation of the nitrogen of peat, P. Hoc (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 20, pp. 631-635).—In pot experiments with varying amounts of peat containing organic matter 76.5 per cent, nitrogen 2.3 per cent, phosphoric acid 0.1 per cent, potash 0.06 per cent, and calcium carbonate 6.1 per cent in comparison with sodium nitrate on sandy, loam, clay, and calcareous soils planted to oats, the first year's results showed decided inferiority for the peat as compared with the nitrate on all except the clay soil. On the latter the peat produced better results than the nitrate but this is attributed to its physical effect. As no check tests are reported, the absolute fertilizing effect of the peat is not shown.

Cyanamid.—Manufacture, chemistry, and uses, E. J. PRANKE (*Easton, Pa., and London, 1913, pp. VI+112, figs. 5*).—This book deals with the manufacture, properties, methods of analysis, storage, decomposition in the soil, and agricultural use and value of cyanamid. Directions are given for the use of the material as a fertilizer, alone and in combination with other fertilizing materials. A chapter also deals with fire and water hazard of cyanamid.

Papers on potash and other salines, H. S. GALE (*U. S. Geol. Survey Bul. 540-N, 1913, pp. 37, figs. 4*).—This bulletin contains a series of notes on what are known as the Quaternary (prehistoric) lakes of the Great Basin with special reference to the deposition of salines and more particularly with reference to the occurrence of potash salts. It includes discussions and analyses of the brines of Death Valley, of the salt, borax, and potash in Saline Valley, Inyo County, California; potash tests from wells in Columbus Marsh, Nevada, and discussions and analyses of deposits of sodium sulphate in Soda Lake in the Carrizo Plains, San Luis Obispo County, California.

The production of available potash from the natural silicates, A. S. CUSHMAN and G. W. COGGESHALL (*Trans. Amer. Inst. Chem. Engin., 5 (1912), pp. 52-67*).—This article has already been noted from another source (*E. S. R., 27, p. 724*).

The decomposition of feldspar and its use in the fixation of atmospheric nitrogen, W. H. ROSS (*Jour. Indus. and Engin. Chem., 5 (1913), No. 9, pp. 725-729*).—Processes for decomposing silicate rocks and for fixation of nitrogen are reviewed and experiments showing the fixation of nitrogen by varying proportions of feldspar, carbon, and calcium carbonate with different times and temperatures of ignition are reported. The highest fixation was obtained by conducting nitrogen over a mixture of 4 parts of feldspar with 2 parts of carbon and 4.3 parts of calcium carbonate heated to 1,400° C., the amount of nitrogen fixed in one hour being 6.1 per cent and in two hours 7.44 per cent of the feldspar taken.

Potash, silica, and alumina from feldspar, E. HART (*Trans. Amer. Inst. Chem. Engin., 5 (1912), pp. 68, 69*).—This article has already been noted from another source (*E. S. R., 23, p. 222*).

On the zeolitic properties of ground phonolite and of lime trass fertilizer in comparison with certain soils, E. BUSSMANN (*Jour. Landw., 61 (1913), No. 2, pp. 97-134, figs. 5; abs. in Jour. Chem. Soc. [London], 104 (1913), No. 609, I, p. 812*).—The phonolite used in these experiments contained 9.41 per cent of potash as silicate, and the lime trass fertilizer (a mixture of lime and trass subjected to the action of steam under high pressure) contained 2.68 per cent, also in the form of silicate. The absorptive power of these materials and of three soils (loam, red, and marsh) for solution of ammonium chlorid, calcium and potassium nitrates, magnesium sulphate, and monocalcium phosphate of varying strengths was determined, but the general conclusion reached was that phonolite and lime trass, used as fertilizers, are of no importance in increasing the absorptive power of soils. It was found, however, that under certain con-

ditions addition of the materials appreciably promoted the growth of free-living *Azotobacter* and thus increased the nitrogen content of the soil.

A bibliography of references to the literature of the subject is given.

The leaching of potash from freshly cut kelp, A. R. MERZ and J. R. LINDEMUTH (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 9, pp. 729, 730).—A number of analyses are reported which, while not entirely conclusive, indicate "that freshly cut kelp, when immersed in sea water, does not, at least at first, lose its potash content very rapidly."

The production of phosphate rock in 1912, W. C. PHALEN (*U. S. Geol. Survey, Advance Chapter from Mineral Resources of the United States, Calendar Year 1912*, pp. 24).—This report gives, besides statistics of production of phosphate rock for the whole country, figures showing the production of the individual States for the last five years. Tables showing imports and exports of fertilizer materials are also given, as well as the production of phosphate rock in the principal countries of the world. The phosphate industry in the different States is briefly discussed, and the author gives general information of interest to those engaged in the phosphate trade.

The phosphate rock marketed in the United States in 1912 amounted to 2,973,332 long tons, valued at \$11,675,774. This represents a slight decrease in both quantity and value, as compared with the figures for the preceding year. The figures for phosphate rock mined showed, however, an increase in every case except in South Carolina, the increase in Florida amounting to 3 per cent, in Tennessee over 12 per cent, and in the western phosphate fields over 10 per cent, as compared with the amounts mined in 1911. Florida produced 81 per cent of the entire output of the United States, Tennessee 14.2 per cent, South Carolina 4.4 per cent, and Idaho, Utah, and Wyoming the remainder.

Phosphate mining industry of Algeria, D. B. MASON (*Daily Cons. and Trade Rpts.* [U. S.], 16 (1913), No. 203, pp. 1240-1242).—The important phosphate deposits of Algeria have been mined for 15 years, the production increasing from 1,057 short tons in 1899 to 550,000 tons in 1912. The principal mining districts are near the towns of Setif and Tebessa. About 60,000 tons of phosphate was used in Algeria in 1912 in the manufacture of superphosphate. The total amount exported in that year was 411,269 tons.

On the value of Tunis phosphate for peat soils, H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr.*, 27 (1913), No. 2, pp. 111-116, fig. 1).—The results obtained indicate that Tunis phosphate is not an economical fertilizer for peat soils in comparison with Thomas slag at present market prices.

A possible commercial utilization of nelsonite, W. H. WAGGAMAN (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 9, pp. 730-732).—A process of separating the ilmenite, or titanite iron, and the apatite of nelsonite by means of a magnet followed by extraction with 32° B. sulphuric acid is described and the commercial possibilities of thus utilizing the mineral are discussed.

Report on phosphatic fertilization, 1905-1910, M. K. KRISTENSEN and H. R. CHRISTENSEN (*Tidsskr. Landbr. Planteavl*, 20 (1913), No. 1, pp. 24-104, fig. 1).—Trials with different phosphatic fertilizers were conducted for six years under a variety of conditions as to soils and special systems of fertilization.

The general conclusion drawn is that superphosphate proved the most certain and quickest acting of the phosphates experimented with. If the fertilizer value of the phosphorus in superphosphate be placed at 100, that of other materials was on the average as follows: On grass land, Thomas slag 94, bone meal 70, ground phosphate (Algiers) 68; on sandy loam soils, Thomas slag 95, bone meal 65; and on clay loam soils, Thomas slag 91, bone meal 51,

ground phosphate 50. The average trade values of the fertilizers during the six years were as follows (phosphoric acid in superphosphate taken as 100): Thomas slag 88, bone meal 78 (61 if the value of the nitrogen therein be considered), and Algiers phosphate 50.

On sandy soils low in lime the Thomas slag proved of about the same value as superphosphate, and is therefore to be preferred in this case, and also for meadows, when the price of phosphoric acid in the slag is 10 per cent lower than that of superphosphate. When phosphoric acid in Algiers phosphate costs only one-half that of superphosphate, it can be applied to advantage on sandy soils low in lime and on meadows, also as a first application on new marshes whose acid reaction tends to render its phosphorus soluble and available to crops.

Chemical examinations were made of the main types of soils included in the experiments, especially with reference to reaction, basicity, and acid-cleaving power (Baumann's method). The results obtained indicate that superphosphate is a good standard by which other phosphatic fertilizers may be judged, and that the application of bone meal (or ground phosphate) is not to be recommended on soils that have been found to contain basic substances, either by the reaction test or by the biological basicity determination (*Azotobacter* test).

The utilization of natural phosphates and silicious lime as fertilizers, T. PFEIFFER (*Engrais*, 28 (1913), No. 37, pp. 1022, 1023).—This is a summary of work on this subject by various investigators, including the author.

The general conclusion is that under certain conditions and for certain purposes natural phosphates may be valuable as a fertilizer but that the value of certain novelties in the treatment of these phosphates to increase their effectiveness remains to be determined. The preponderance of evidence seems to indicate that silicious lime is not only not harmful in the soil but may be beneficial.

Analyses of agricultural lime sold in Maryland, H. B. McDONNELL ET AL. (*Md. Agr. Col. Quart.*, 1913, No. 60, pp. 11).—The results of inspection of agricultural lime under the state law which went into effect in June, 1912, are reported with brief explanatory notes.

Note on the influence of the lime-magnesia ratio upon plant growth, O. LOEW (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 3, pp. 257, 258).—Referring to an article by Gile and Ageton (*E. S. R.*, 28, p. 812) showing that citrus trees, pineapples, and sugar cane thrive well on soils containing wide ratios of lime to magnesia, the author maintains that citrus trees and pineapples belong to the class of lime-loving plants which are capable of maintaining a suitable lime-magnesia ratio by precipitating as oxalate the excess of lime taken up from the soil. The results with sugar cane are held to be inconclusive.

On the influence of the lime-magnesia ratio, P. L. GILE and C. N. AGETON (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 7, pp. 564-567).—The article cites the results of experiments with bush beans on soils containing varying amounts of lime which showed that the lime-magnesia ratio in the plants grown bore no relation to the ratio of the substances in the soil. "Bush beans appear to be independent of the lime-magnesia ratio in these soils and also of the increasing amounts of carbonate of lime. . . . Since the lime content of the plants remained constant with increasing amounts of lime in the soil it does not seem possible that this plant could have adapted itself to the conditions by precipitation of lime as oxalate."

Pot culture experiments, 1910-11-12, J. A. VOELCKER (*Jour. Roy. Agr. Soc. England*, 73 (1912), pp. 314-338, pls. 7).—These included experiments in continuation of those of previous years (*E. S. R.*, 23, p. 319) on the influence of lithium, zinc, and lead salts on wheat, and on the relation of lime to magnesia in soils.

The conclusions from several years' investigations with lithium salts are "(1) that lithium, in the form of any of its salts, produces a toxic effect if it is present in the soil to the extent of 0.003 per cent or above that amount; (2) the toxic effect is greater the more lithium there be present, and as between different salts of lithium the nitrate is the most toxic; (3) when present in the soil to an amount not exceeding 0.002 per cent, lithium possesses a stimulating influence and is no longer toxic in nature; (4) while this applies to all salts of lithium, the nitrate would seem to be the most stimulating salt, and to produce the best results when present not in excess of 0.001 per cent lithium; (5) the action of lithium salts on vegetation is exerted mainly in the early stage of the germination of the seed."

The effect of zinc and lead salts on vegetation was very different from that of lithium salts. It was found, for example, that zinc could be used with impunity in ten times the amount of lithium, and lead probably to an even greater extent.

The experiments on the ratio of lime to magnesia led to the general conclusions "(1) that magnesia may, with advantage to the wheat plant, be added to a soil poor in magnesia, so long as the amount of magnesia in the soil does not exceed that of lime; (2) as the ratio of lime to magnesia approaches 1:1, a benefit will continue to accrue, but if magnesia be in excess a toxic influence will be exercised and the crop be diminished; (3) soils in which magnesia is in excess of lime will not give fully satisfactory results as regards corn growing, but will be benefited by the addition of lime; (4) lime used in excess does not possess the toxic influence which magnesia, similarly used, has; (5) magnesia and lime alike are capable of modifying the growth of the wheat plant, altering the nature and extent of the root development and the character of the grain. These modifications are mainly shown in the stronger and greener appearance of the flag, the production of a much developed and very fibrous root growth, and the greater assimilation of nitrogen resulting in the obtaining of a more glutinous grain."

The effect of sulphites, thiosulphate, and sulphur in the soil on the growth of plants, W. THALAU (*Landw. Vers. Stat.*, 82 (1913), No. 3-4, pp. magnesia ratio by precipitating as oxalate the excess of lime taken up from the 161-209, figs. 8; *abs. in Chem. Zentbl.*, 1913, II, No. 11, pp. 985, 986; *Ztschr. Angew. Chem.*, 26 (1913), No. 82, *Referatenteil*, p. 601).—From the results of pot and water culture experiments made during 1911 and 1912 the author concludes that ammonium sulphite had about the same fertilizing effect as ammonium sulphate on loam soils, was somewhat less effective on sandy soils, but gave much smaller yields on peat soils. In water cultures even very small amounts, 0.4 per cent, of ammonium sulphite were very injurious to plants and a 1 per cent solution completely destroyed the germinating plants, while a 1 per cent solution of ammonium sulphate was without injurious effect. When exposed to the air, ammonium sulphite quickly oxidized to ammonium sulphate, and the oxidation was still more rapid when the salt was mixed with soil. Calcium sulphite did not reduce the yield either in loam or sandy soils but appeared to be injurious in peat soils. In water cultures the injury to growth increased with increasing amounts of the calcium sulphite. Sodium thiosulphate was without injurious effect on the plant yield. The results with sulphur in form of flowers of sulphur were inconclusive.

[Fertilizer inspection in Alabama], B. B. ROSS (*Bul. Agr. Dept. Ala.*, 1913, No. 59, pp. 152).—Analyses and valuations of fertilizers examined during the year ended June 30, 1913, are reported with notes on fertilizer requirements of soils, the composition, sources, and properties of fertilizers, mixing fertilizers on the farm, and fertilizer laws of the State.

Fertilizer analyses, H. B. McDONNELL ET AL. (*Md. Agr. Col. Quart.*, 1913, No. 61, pp. 40).—This bulletin gives tables showing analyses and valuations of fertilizers inspected from February to July, 1913, inclusive.

Analyses of fertilizers, spring season, 1913, B. W. KILGORE ET AL. (*Bul. N. C. Dept. Agr.*, 34 (1913), No. 3, pp. 99).—This bulletin contains analyses and valuations of fertilizers collected by the fertilizer inspectors of the state department of agriculture during the spring of 1913, as well as a list of brands of fertilizers registered during the fall of 1912.

[**Fertilizer inspection in Ohio**] (*Off. Bul. Ohio Dept. Agr.*, 4 (1913), No. 4, pp. 23-65).—Guaranteed analyses of fertilizers licensed for sale in Ohio from January 1 to June 1, 1913, and analyses and valuations of samples examined during December, 1912, are tabulated.

AGRICULTURAL BOTANY.

Studies in Trifolium, P. B. KENNEDY (*Muhlenbergia*, 9 (1913), No. 1-2, pp. 1-29, pls. 5).—In continuation of a series of papers previously noted (E. S. R., 21, p. 27), the author gives an account of studies of the *Macraei* group of *Trifolium*, the information being based not only on herbarium specimens but also on greenhouse and field material.

Botanical and agronomic studies on Typha, J. B. GÈZE (*Etudes Botaniques et Agronomiques sur les Typha. Villefranche-de-Rouergue, 1912, pp. VIII+174, pls. 8*).—Besides a morphological study of the various species and varieties of *Typha*, an account is given of a cultural study carried out with *T. domingensis australis* in the marshy lands of Fos (Bouches-de-Rhône), resulting, it is claimed, in the establishment of two subvarieties and in the elaboration of improved methods of cultivation.

Notes on pollination and cross-fertilization in the common rice plant, G. P. HECTOR (*Mem. Dept. Agr. India, Bot. Ser.*, 6 (1913), No. 1, pp. 10).—The results are given of a study of the characters of single rice plants in order to ascertain to what extent natural cross-fertilization takes place, this being preliminary to work in producing seed of improved types.

It is found that under favorable conditions in Lower Bengal cross-fertilization may take place in rice to the extent of about 4 per cent of the plants. This is brought about wholly by the agency of the wind, and would be effective only between flowers of adjacent plants within a radius of a few feet. The author states that so long as seed of a variety is kept free from accidental mixture there is little risk of contamination from cross-fertilization.

Some studies are reported on the segregation of characters, and so far as grain color is concerned it appears to follow Mendelian lines.

The relationship between the weight of the seed planted and the characteristics of the plant produced, I, J. A. HARRIS (*Biometrika*, 9 (1913), No. 1, pp. 11-21, figs. 3).—This is the first of a series of papers by the author, and is devoted to the presentation of data on the number of pods per plant of beans. This study was made on three varieties grown in 20 series to determine, among other things, the influence of the weight of the seed on the number of pods produced. The seeds were carefully selected to secure sound mature specimens. The seeds were carefully dried, weighed, and divided into three lots and planted under conditions that it was believed would reduce the liability to error as much as possible.

The essential data showing the number of pods produced by each grade of seed are presented, from which it appears that while the mean number of pods may not increase at the same rate from the lowest to the highest, the lightest viest, grade of seeds, practically they may be considered as doing so.

The coefficients of correlation were rather small, but they were in every instance positive, indicating that the selection of larger seeds will give a somewhat higher yield of pods.

Weeds in relation to soils—Norfolk, WINIFRED E. BRENCHELEY (*Jour. Bd. Agr. [London]*, 20 (1913), No. 3, pp. 198-205).—In continuation of a series of papers (E. S. R., 29, p. 30), the author reports the results of an investigation conducted on soil of Norfolk to determine the relation of weeds to different types of soil.

The effect of some Puget Sound bog waters on the root hairs of *Tradescantia*, G. B. RICE (*Bot. Gaz.*, 55 (1913), No. 4, pp. 314-326).—The author advances the theory that plants other than bog xerophytes are excluded from peat bogs because of their inability to produce normal root hairs in the toxic habitat of bogs.

The experiments show that *Tradescantia* produces stunted root hairs when grown in bog water, as compared to normal root hairs in water from open lakes or springs immediately adjacent to bogs. When grown in water from drained or partially drained bogs the plants produced almost normal root hairs. The stunting of the root hairs by bog water is comparable with that due to dilute solutions of sea water, formalin, tannic acid, gelatin, coffee, and tea. When bog water was diluted with an equal volume of tap water, or in some cases with one-half its volume of tap water, the stunting effect on the root hairs disappeared. The stunting effect may be increased by boiling the water down to a fraction of its original volume. Many typical bog plants are said to have no root hairs, and there is believed to be a toxin or toxins in bog water the effect of which disappears with drainage of the bog.

The relation of environmental conditions to the phenomenon of permanent wilting in plants, J. S. CALDWELL (*Physiol. Researches*, 1 (1913), No. 1, pp. 1-56, figs. 8; *Prelim. Abs.*, pp. 4).—From the study of *Phaseolus vulgaris*, *Xanthium commune*, *Martynia louisiana*, and *Physalis angulata linkiana* in midsummer conditions in southern Arizona, the author reached the following conclusion:

"Permanent wilting appears to be a condition of general plasmolysis (but not of death) in all the tissues of the plant, with accompanying cessation of certain of the protoplasmic activities. This condition is characterized by a water content of the functioning foliage which is nearly constant for any species. The reduction of the water content to this point is the resultant of the action of transpiration versus root absorption; if aerial conditions permit these two processes to go on at approximately equal and moderate rates until the water supply fails at its source, there remains in the soil a quantity definitely related to the physical constants of the soil. . . . This excess of soil water is only effective temporarily to preserve the life of the root hairs; its amount is more or less definitely related to the aerial conditions prevailing throughout the period of wilting and rises with increase in the transpiration rate. Thus the only constant with which we have to deal in cases of wilting under widely varying conditions is a physiological constant, a condition of the plant protoplasm with respect to water, which arises as a result of the interaction upon the plant of a complex of external conditions, of which the soil moisture content is only one. The soil moisture content at permanent wilting is therefore a variable which increases with change in the value of the other terms of the equation, especially with increase in the evaporating power of the air beyond a certain limit; and it is not to be considered as independent of these other terms."

A bibliography of the subject is appended.

The causes of transpiration and of retention of water vapor by plants, LECLERC DU SABLON (*Rev. Gén. Bot.*, 25 (1913), Nos. 290, pp. 49-83; 291, pp. 104-124; *abs. in Zentbl. Zool. Allg. u. Expt. Biol.*, 3 (1913), No. 5, pp. 175, 176).—In continuance of previous work (E. S. R., 26, p. 430), the author studied transpiration as shown by different plants subjected to various factors and conditions.

As a result he states that in general those circumstances which tend to contract the protoplasm diminish the permeability of the membrane and may thereby enormously reduce transpiration, other factors remaining the same. Plasmolysis may reduce transpiration considerably. Anesthetics first diminish transpiration, apparently by contracting the protoplasmic cell membrane; after a period of resistance a pathologic condition seems to ensue, the protoplasm relaxing, when transpiration may greatly increase. This increase may continue so long as the plant lives. In variegated or in colorless plants, both direct and diffused light heighten transpiration in somewhat the same degrees as in green plants, no exclusive part being played apparently by chlorophyll in the absorption of solar energy; and the same general statement applies in the case of heat, which also heightens transpiration. Fleshy succulent plants or parts show low transpiration rates, corresponding to the low permeability of their protoplasmic membranes and their slight sensibility to heat and light, these characters being marked in case of plants habituated to dry conditions.

The author concludes that elevation of temperature augments transpiration through increase of vapor tension in a purely physical way and independently of other causes, also through increase of permeability, this effect being physiological and depending upon the characters of the plant itself; also that solar energy influences transpiration directly by affecting the permeability of the cell membranes, this being also physiological and variable according to the plant tissues involved, as well as indirectly by elevating the temperature, no direct and necessary relation of chlorophyll as such to transpiration being inferred, but the general parallelism between the two being ascribed to the structure necessary to gaseous exchange, which it is held inevitably entails some correspondence as regards transpiration; and finally that while evaporation at the surface of the cell is a physical phenomenon involving risk to the plant, the retention of water is a physiological function indispensable to life.

A brief bibliography is appended.

The ascent and descent of water in trees, A. J. EWART (*Proc. Roy. Soc. Victoria, n. ser.*, 25 (1912), No. 1, pp. 115-119, pl. 1).—Continuing former investigations (E. S. R., 23, p. 26), regarding the part played by living cells in sap ascent, the author experimented with a 4-year-old tree of *Acacia mollissima* 25 ft. high and 26 in. in circumference near the ground where, after surrounding the trunk with water, both bark and wood were cut cleanly away to a depth of 1½ in. Copper sulphate was then added to make up a 5 per cent solution in contact with the cut surface.

The rate of absorption, at first rapid, later began to fall off considerably. After 26 liters had been absorbed in 4½ hours eosin was substituted. Its absorption was much slower and in turn showed a decrease. It was later found that the eosin was largely fixed in the walls of the wood vessels with very little lateral diffusion, showing the almost exclusive part played by the wood vessels in the ascent of the sap. The eosin was held back to such an extent as to render it useless as a measure of the sap movement; for when the tree was cut down at the end of the third day the red dye had risen only about 10 ft., being restricted to the outer layers of wood from 1 to 1.5 in. in depth at the base, thinning out upward to 0.25 in. Traces of copper were detected in the outer wood at the top of the tree. At the same time it was found that the eosin had traveled down the stem, showing as far as 7 ft. along the lateral roots to those 0.5

in. in diameter. The coloration indicated a greater flow downward than up the stem. It was thought that a large part of the water first absorbed might have traveled in this direction either in bringing the wood up to full saturation or else in escaping through the roots into the soil under gravity, or both.

The author concludes that the experiment affords no decisive answer to the question whether the lifting forces operative are derived solely from the suction of the leaves or are partly the result of agencies acting in the stem along the path of the transpiration current.

The relation between evaporation of water and the weight of vegetable matter elaborated by maize, MAZÉ (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 9, pp. 720-722).—The author gives in tabular form the results of his experiments with maize, claiming that the quantity of water evaporated thereby per kilogram of vegetable dry matter is approximately constant and is independent of the nature and concentration of the nutritive solution, as well as the plant's state of development, being about 133 kg. per kilogram of vegetable dry matter.

The influence of oil reserves of seeds and of temperature on the respiration coefficient, S. L. IVANOV (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 14 (1913), No. 2, pp. 75-87, figs. 2).—Experimentation with sprouting seeds rich in oil is considered to show that temperature exerts considerable influence upon the coefficient of respiration. It is held that at lowered temperatures metabolic changes occur of a kind different from those usual to the plant, not necessarily involving the production of carbon dioxid. The respiration coefficient is said to depend partly upon external conditions and upon the nature of the plant and not to be constant for any group with oil-containing seeds.

Concerning the character of the anaerobic respiration of different seed plants, S. KOSTYTSCHÉW (*Ber. Deut. Bot. Gesell.*, 31 (1913), No. 3, pp. 125-129).—In continuation of previous work (E. S. R., 26, p. 627) the author, claiming other origin than the action of enzymes for a part of the carbon dioxid evolved in certain experiments, carried out investigations employing leaves, roots, tubers, and fruits of several common plants.

The results are claimed to support the view that in the majority of cases the anaerobic respiration of seed plants is not simply identical with enzymic fermentation alone. It is believed that further investigation of the nature of anaerobic respiration of plants is likely to extend our conception of respiration, and that in the majority of cases fermentation and other related decompositions occur simultaneously.

The pentosans in the germination of seed, L. B. BERNARDINI and F. GALUCIO (*Staz. Sper. Agr. Ital.*, 45 (1912), No. 11, pp. 874-884).—The authors report that wheat grains germinating in darkness show a gradual and those in light a more positive, but still slight, increase in pentosan content. The cellulose content is said to show in darkness first a gradual increase but later a decided decrease, while in light a substantial increase is noted in the successive stages of the germination process. The possible bearings of these facts are also discussed.

The catalytic action of light in the germination of seeds sensitive to light, E. LEHMANN and A. OTTENWÄLDER (*Ztschr. Bot.*, 5 (1913), No. 5, pp. 337-364).—To brief notice of the related work of others previously published, the authors add the results of their own studies carried out with *Verbascum thapsiforme*, *Epilobium hirsutum*, and *Lythrum salicaria*, leading to the conclusion that the proteolytic enzymes cause or favor germination in darkness of seeds normally requiring light for that process. A bibliography is appended.

The influence of illumination on the formation and germinability of seeds, R. COMBES (*Rev. Gén. Bot.*, 25 (1913), No. 291, pp. 130-141).—Following previous experiments with light influences on plants (E. S. R., 23, p. 723), the author studied the effects on the developing seeds of several common weeds, chosen at random, of illumination varying from full sunlight down to about 0.11 of that intensity. It was found (1) that while the number of fruits and seeds in each and the proportion of well-formed seeds diminished continuously with decrease of light, the volume and the weight of the well-formed seeds increased to an optimum, after which these also decreased; also (2) that the percentage of seeds capable of germination increased in the same way to an optimum illumination about the same as that just mentioned.

Energy assimilated by plants cultivated under different illuminations, E. ROSÉ (*Ann. Sci. Nat. Bot.*, 9. ser., 17 (1913), Nos. 1, pp. 64, figs. 34; 2-4, pp. 65-110, figs. 12).—Employing the technique of Combes (see above), the author carried out a series of studies on *Pisum sativum*, as a typical sun-loving plant, and *Teucrium scorodonia*, representing the shade plants, regarding the influence of illumination in producing variations in the fresh and the dry weight of plants, in the internal or external morphological characters of leaves or of the entire plant, and in the chlorophyll concentration in the leaves. Studies on energy of absorption comprehended (1) those with different leaves at the different illuminations under which they developed, also (2) those with leaves under the same illumination (direct sunlight) which had been developed under different illuminations. To these are added an account of some complementary experiments on the relations between leaf structure and energy assimilation.

In the first type, at or about 0.75 of the normal illumination, the appearance was unchanged but the dry weight decreased. In the second type, at the same illumination, the appearance was normal, as was also the total dry weight, but there was a slight increase of dry weight in the aerial portions. At 0.67 of normal illumination the normal appearance ceases in case of the sun-loving type and the dry weight of the shade plant begins to decrease, and this continues, the normal appearance of the latter being maintained, however, down to 0.33. The optimum illuminations for the leaves do not coincide with those for the plants as a whole. Plants of the type best suited to sunlight showed normally well-differentiated palisade cells, those of the shade-loving type a loose texture. Assimilation proceeded more actively in strong light with the former structure; in weaker light, with the latter.

Plant cultures in colored light, H. WELTEN (*Kosmos*, 1913, No. 5, pp. 181-185, figs. 4).—As the result of experiments along the same lines as those of Flammarion (E. S. R., 24, p. 720), the author found that several common plants grown under colored light showed well-defined alterations of habit as regards growth, proportion, and other qualities, which are discussed in connection with the previous work referred to.

Branch movements induced by changes of temperature, J. G. GROSSENBACHER (*Science*, n. ser., 38 (1913), No. 971, pp. 201-205).—This is a review of the literature of branch movements and a report of observations which grew out of a study of the crown rot of fruit trees. The literature quoted seems to indicate a decided movement of branches of trees due to changes of temperature.

Reversibility of the physiological processes in the ripening of seeds, S. L. IVANOV (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 14 (1913), No. 2, pp. 64-74, fig. 1).—It is stated that seeds of *Linum usitatissimum*, *Brassica napus oleifera*, and *Papaver somniferum*, carefully collected and tested at several stages of ripening, showed a respiration coefficient almost always less than unity, a result contrasted with the findings of Godlewski (E. S. R., 27, p. 226) and Gerber. It is suggested that, while normal physiological processes

follow favorable conditions for reaction (as direct sunlight, normal transpiration, etc.), these processes or some of them seem to be reversed in the plant in unfavorable weather, as continued rains, etc., the respiration coefficient of the ripening seed taking the value of that proper to sprouting in the same seed. The facts observed are held to afford a fresh confirmation of the reversibility of analytic or synthetic processes, as related here possibly to ferments.

A physiological and chemical study of after-ripening, SOPHIA ECKERSON (*Bot. Gaz.*, 55 (1913), No. 4, pp. 286-299).—This paper gives the results of a microchemical study together with quantitative determinations of the substances in the embryo of species of *Crataegus* at different periods during after-ripening. Previous investigators (E. S. R., 28, p. 226) have shown the best conditions for after-ripening of seeds of this plant, and the author followed their suggestions relative to temperature and moisture.

It was found that food was stored in the embryo in the form of fatty oil. There was also considerable lecithin, but neither starch nor sugar was present in embryos kept in dry storage. The reaction of the cotyledons was found to be acid, while that of the hypocotyl was slightly basic. A series of metabolic changes in the embryo was found to take place during the period of after-ripening. The initial change seemed to be an increased acidity, but correlated with this was an increased water-holding power and an increase in the activity of catalase and peroxidase. Near the end of the period of after-ripening a sudden increase in acidity as well as in water content took place and oxidase for the first time appeared. At this time the fats decreased and sugars appeared. Hydrocyanic acid was always to be found in the cotyledons.

The after-ripening period, it was found, could be greatly shortened by treating the embryos with dilute acids, such as hydrochloric, acetic, and butyric acids. When treated with acids the water-holding power, the acidity, and the amount of peroxidase increased much more rapidly and oxidase appeared much earlier than in untreated embryos.

It appears that there is a correlation between the acidity of the hypocotyl of *Crataegus*, and its water-absorbing power, production of enzymes, and germinating power.

A bibliography is appended.

Cellulose as a source of energy for nitrogen fixation, I. G. MCBETH (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 131, pp. 25-34*).—From a review of the literature, the author considers that there are not sufficient data to show that the presence of combined nitrogen in the culture media reduces or destroys the nitrogen-fixing properties of organisms which show a pronounced nitrogen-fixing power in nitrogen-free solutions. On the contrary, he believes that the data indicate that the nitrogen-fixing power of some organisms may be greatly stimulated by the addition of nitrogen to the culture medium.

Experiments carried on to determine the effect of ammonium sulphate upon the nitrogen-fixing power of *Azotobacter chroococcum* and *A. beijerinckii* in nutrient solutions indicated that the addition of 0.1 per cent of ammonium sulphate to the nutrient solution increased their nitrogen-fixing power.

Another series of experiments on the nitrogen fixation of *Azotobacter* associated with *Bacillus rossica* showed that with mixed cultures in solutions containing both dextrose and cellulose as sources of energy decided gains were obtained over *Azotobacter* alone only when the solutions contained a considerable quantity of initial nitrogen and a destruction of the cellulose occurred.

A. chroococcum and *A. beijerinckii* in association with *B. rossica*, *Bacterium fimi*, or *B. flavigena* fixed quantities of nitrogen varying from 7.72 to 11.41 mg. for each 500 cc. of solution containing cellulose only as a source of energy.

A bibliography is appended.

The fermentation of cellulose, K. F. KELLERMAN and I. G. MCBETH (*Centbl. Bakt. [etc.]*, 2. Abt., 34 (1912), No. 18-22, pp. 485-494, pls. 2).—This is a detailed account of investigations previously reported upon (*E. S. R.*, 26, p. 825).

The question of cellulose fermentation, W. OMELIANSKY (*Centbl. Bakt. [etc.]*, 2. Abt., 36 (1913), No. 19-25, pp. 472, 473).—This is a criticism of the above work.

The use of congo red in culture media, K. F. KELLERMAN (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 130*, pp. 15-17).—In a previous publication (*E. S. R.*, 25, p. 44) attention was called to the value of congo red for the identification of the organism *Bacillus tumefaciens*, the cause of crown gall of orchard trees, vines, and other plants. Subsequent investigations with a large number of species of bacteria grown on various media have shown that when grown in a nitrogen-poor medium, *B. tumefaciens* strongly absorbs the dye. In this respect it is much more active than any of the other organisms, although several species were stained by it. When grown in a beef agar, at least 4 other species of bacteria were found to absorb the dye to a greater extent than the causal organism of crown gall. The absorption of congo red by certain strains of bacteria is believed to be a phenomenon associated with some protoplasmic function.

The physiological functions of calcium, O. LOEW (*Flora, n. ser.*, 5 (1913), No. 4, pp. 447, 448, fig. 1).—Referring to studies previously reported (*E. S. R.*, 4, p. 221), the author explains the contraction of the nuclei in cells subjected to potassium oxalate solutions of from 0.5 to 2 per cent strength as due probably to the extraction of the water of imbibition on the withdrawal of the calcium from the nucleus.

The action of manganese dioxid and other metallic compounds on the germination of seed, U. VARVARO (*Staz. Sper. Agr. Ital.*, 45 (1912), No. 12, pp. 917-929).—As the result of experiments employing oxids of manganese, iron, uranium, cerium, copper, zinc, aluminum, cadmium, mercury, and lead, the author found in germination experiments with kidney beans that the various oxids tested exerted a retardative effect, possibly excepting oxid of lead; that with maize the oxids of zinc, lead, copper, cadmium, aluminum, and uranium exercised accelerative influence; and that with beans a decidedly detrimental effect was produced by the use of 0.25 per cent solution of any of the metallic compounds tested.

The effect of certain chlorids singly and combined in pairs on the activity of malt diastase, L. A. HAWKINS (*Bot. Gaz.*, 55 (1913), No. 4, pp. 265-285).—A report is given of investigations on the effects of the chlorids of sodium, potassium, calcium, magnesium, copper, and iron on the hydrolytic activity of Merck's diastase of malt.

A wide variation was shown in the influence of the different chlorids upon diastatic action, and this is thought probably to be related to the properties of the various cations employed. More or less pronounced acceleration of starch hydrolysis was shown for all the salts used at different concentrations. Retardation of hydrolysis was shown at high concentrations for all salts except sodium and potassium chlorids. Combinations of two salts were shown to be sometimes more and sometimes less efficient in modifying diastatic action than were molecularly equal concentrations of their component salts. It is thought possible that enzymic power may in some cases at least be more highly developed by the presence of a properly balanced salt combination than is possible through the influence of single salts.

Self-poisoning in cultures of *Penicillium* as the result of nitrogen feeding, C. WEHMER (*Ber. Deut. Bot. Gesell.*, 31 (1913), No. 4, pp. 211-225, figs. 3).—The author states, along with numerous other details, that self-poisoning was

marked after 30 days in case of *Penicillium variable* in cane sugar solution with ammonium sulphate as the nitrogen source.

Copper treatments and nitrification in the soil, G. PATUREL (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 23, pp. 711-714).—In experiments bearing upon the question whether the copper treatments used against cryptogamic diseases may not be detrimental to the process of nitrification, the author claims to have shown that the presence in the soil of copper salts from such treatments opposes no important obstacle to nitrification. It is stated in explanation that the copper salts introduced into the soil rapidly take an insoluble form in the presence of carbonate of lime and oxids of iron and of aluminum.

The effects of poisons at different concentrations upon seeds, V. ARCICHOV-SKIJ (*Biochem. Ztschr.*, 50 (1913), No. 3-4, pp. 233-244, pl. 1, figs. 5).—From a study of the influence of several poisons on seeds, the author concludes that the markedly nonpoisonous influence of very high concentrations is a phenomenon of a general character but limited in its manifestations by the low solubility of some poisons. The causes of this result, it is thought, may be complicated, including such factors as (1) the slow or slight penetration of the stronger solutions of the poisons employed, (2) the lowered chemical activity of the dried seed protoplasm, and (3) the lowered relative and absolute dissociation of these poisons when in strong solutions. It is thought that in case of non-electrolytes, polymerization may play an important part. Further researches are contemplated regarding these points.

Toxicity of smoke, L. I. KNIGHT and W. CROCKER (*Bot. Gaz.*, 55 (1913), No. 5, pp. 337-371, figs. 4).—In a series of experiments to determine the reliability of the etiolated epicotyl of the sweet pea as a test for the presence of traces of heavy hydrocarbons in the atmosphere, the authors extended previous work (E. S. R., 29, p. 132) and made a study of the response of this organ to smoke produced by the burning of various carbon-bearing substances, with the idea of discovering the constituent or constituents that produce this response. The substances used included smoke from tobacco, cigars, and cigarettes, smoke from cellulose paper smoked as a cigarette, etc.

In the case of cigar smoke washed with sulphuric acid and sodium hydroxid, 1,000 parts per million of atmosphere produced a triple response in the epicotyl of the sweet pea, resulting in the reduction of the rate of elongation, swelling, and diageotropism of the portion growing in the impurity. On the basis of dry weight burned, the washed smoke from cellulose paper cigarettes was even more toxic.

Cellulose paper smoked as a cigarette and burned as an open sheet were compared, and it was found that the former was 50 times as toxic as the latter, the higher oxygen supply during burning evidently reducing toxicity.

In the cigarette smoke of cellulose paper, the authors found carbon dioxid, carbon monoxid, acetylene, ethylene, methane, and some higher homologues of the last three. It is believed improbable that acetylene and propylene play any part in the toxicity of paper smoke, and the great toxicity of ethylene makes it probable that it determines the toxic limit.

In addition to the gases mentioned above, tobacco smoke bears hydrogen sulphid, ammonia, nicotin, hydrocyanic acid, and pyridin. None of these produced the type of response caused by the smoke, and it is considered that they exist in concentrations far below that necessary to determine the toxic limit.

The etiolated epicotyl of the sweet pea was found to be a very delicate test for the heavy hydrocarbons, such as ethylene, exceeding by many fold the delicacy of any chemical test.

A bibliography is appended.

Injuries to plants by coal tar vapors from the Plania works at Ratibor, R. EWERT (*Ber. K. Lehranst. Obst u. Gartenbau Proskau, 1911, p. 76. In Landw. Jahrb., 43 (1912), Ergänzungs. 1*).—This is a discussion of the effect of gases from the manufacture of carbon pencils condensing on the neighboring vegetation. The gases are said to be injurious to fruit trees, bush beans, potatoes, and cabbage, but harmless to many other plants. Further studies will be published later.

FIELD CROPS.

[Field crop experiments], J. A. CLARK (*Ann. Rpt. Dept. Agr. Prince Edward Island, 1911, pp. 26-32*).—This paper reports the results of various tests during 1910-11, of which some of the highest yields per acre were wheat 48.49 bu., oats 136 bu., barley 80 bu., 2-rowed barley 83 bu., peas 44 bu., potatoes 330 bu., corn 30 tons, turnips 33 tons, carrots 15 tons, mangels 36.5 tons, and sugar beets 21 tons.

[Field experiments], R. M. WILSON (*Essex Ed. Com., Rpt. Field Expts., 1911, pp. 44, figs. 10*).—This report contains results of variety tests with wheat, barley, oats, potatoes, mangels, thousand-headed kale, maize, sugar beets, Chinese barley, linseed, and Western and wolths grass. The yield of sugar beets averaged 9 tons 8.27 cwt. per acre, the sugar content ranging from 14.9 to 17.5 per cent. Canadian varieties of maize averaged 11 tons 10.88 cwt. per acre in comparison with 8 tons 17.71 cwt. from English varieties.

Sure feed crops, J. FIELDS (*Oklahoma City, Okla., 1912, pp. 188*).—This book contains discussions of the principal grain, forage, and pasture crops especially adapted to the southwestern United States.

Experiments on permanent grass land, 1912, E. KINCH and R. G. STAPLEDON (*Agr. Students' Gaz., n. ser., 16 (1912), No. 1, pp. 1-12*).—This report gives tabulated results and discussions of the 1912 yields in an experiment which has been running for 21 years. In fertilizing grass land superphosphate was generally found to be the best phosphatic manure in a calcareous district, and basic slag where lime was deficient. Where buttercups were very plentiful, fertilizing with sulphate of ammonia and ashes greatly diminished them.

Manuring experiments on grass for hay, E. KINCH, D. TURNER, and R. G. STAPLEDON (*Agr. Students' Gaz., n. ser., 16 (1912), No. 2, pp. 43-57*).—In comparing 4 cwt. of superphosphate and 1 cwt. of potassium sulphate together and in combination with 1.5 cwt. ammonium sulphate per acre in experiments conducted on different farms in Gloucestershire, it was found that in general the potash and phosphoric acid alone apparently more than doubled the percentage of stand of legumes. The addition of the ammonium sulphate depressed the yield of legumes very slightly and caused a falling off of over one-half of the buttercup plants as well as of other weeds. Perennial rye grass and meadow foxtail were greatly increased by the addition of the ammonium sulphate. In an experiment to compare the value of 2 cwt. of ammonium sulphate in addition to 4 cwt. superphosphate and 4 cwt. kainit per acre with mangolds, the ammonium sulphate application resulted in an increased yield of from 3 to 5 tons per acre.

Manurial experiments on meadows, with special reference to the lasting effect of the applications, E. HOTTER, J. STUMPF, and E. HERRMANN (*Ztschr. Landw. Versuchsw. Österr., 15 (1912), No. 2, pp. 133-146*).—This paper reports the use of the following fertilizer applications per hectare of grassland for the first year, and the effects as observed for the 4 succeeding years: 480 quintals (53 tons) barnyard manure, 700 kg. Thomas slag, 1,420 kg. kainit, 240 kg. ammonium sulphate, 345 kg. potassium sulphate, 700 kg. calcium sulphate, and 300 kg. straw ashes, either singly or in combination.

In general the increase in yield over the check plats gradually became smaller with each year after the first, which gave the largest yields and the greatest profits. The barnyard manure showed the greatest profit, but by the fifth year seemed to be exhausted. The final results of the 5 years showed the greatest increase in profits from the barnyard manure, followed by kainit, then by the combined application of Thomas meal and kainit, and the least by the combination of Thomas slag, potassium sulphate, calcium sulphate, and straw ashes. Due to the high price of the other fertilizers and the low price of hay, the author states that the remainder of the applications were made at a loss.

Experiments to determine the influence of the height of the ground water table on the yield of grass and hay, O. PITSCH (*Meded. Rijks Hoogere Land. Tuin en Boschbouwsch.* [Wageningen], 6 (1913), No. 1, pp. 1-39, fig. 1).—This experiment was conducted with large galvanized cans sunk into the ground and the water table maintained at approximately 40, 60, and 80 cm. in the grass crop and 40, 50, and 70 cm. in the hay-crop experiments. Tabulated results are given for 1909, 1910, and 1911.

The most noteworthy results were obtained during the last 2 years. In 1910 the grass pots yielded 717.2 gm., 780.6 gm., and 845 gm., respectively, of dry matter and 380.43 gm., 442.45 gm., and 454.45 gm., respectively, in starch value. The hay yields for the same year were 1,508 gm., 1,137, and 1,245 gm., respectively, of dry matter and 276.17, 307.91, and 335.46 gm., respectively, in starch value. In 1911 the pots yielded 613.5 gm., 540.5, and 530 gm., respectively, of dry matter, and 325.45 gm., 283.33 gm., and 276.43 gm., respectively, in starch value, while the hay yields were 752 gm., 778, and 614 gm., respectively, of dry matter, and 225.87, 206.21, and 153.73 gm., respectively, in starch value.

Experiments on the culture and selection of some marsh crops made in 1908-9, M. J. B. GEZE (*Ann. Dir. Hydraul. et Amélior. Agr., Min. Agr.* [France], 1909, No. 40, pp. 17-27, pl. 1).—In pot experiments it was the author's aim (1) to determine distinctive characteristics and cultural requirements of numerous varieties of *Typha*; (2) to compare economic and cultural characteristics of each species arising from different local conditions; and (3) to investigate the influence of the nature of the soil and fertilizer applications on the same crops.

On the basis of the 2 years' work with pot cultures, it is noted that the richness of the soil in nitrogen, phosphorus, and potash plays an important part in the development of the Cyperaceæ and *Typha*. The influence of the mechanical composition of the soil is almost nothing in comparison to that of the mineral application. The application of sulphate of ammonia, superphosphate of lime, and sulphate of potash distinctly favored the development and improvement of the market qualities of these plants. Nitrogen apparently greatly reduced the number, length, and width of the leaves, also the average weight of each, and therefore the value and weight of the entire crop. Acid phosphate increased the weight, length, and number of shoots and especially their size. The action of potash was less conspicuous. In field experiments on marsh lands, sulphate of ammonia gave even better results than in pot experiments. The addition of potash and phosphorus favored the development of the species other than *Carex*.

Grazing investigations, G. A. PEARSON (*U. S. Dept. Agr., Rev. Forest Serv. Investigations*, 2 (1913), pp. 9-13).—The results of trials of Kentucky blue grass, orchard grass, brome grass, redtop, Italian rye grass, timothy, and alfalfa sown in open park areas, forests, fields, and pastures to improve the range conditions showed all of these species to be failures when sown with no other preparation than harrowing. It is noted that timothy, alfalfa, and brome

grass showed indications of becoming established if persistently tried on plowed ground, although their introduction was not considered practical.

Measuring hay in ricks or stacks, H. B. McCLURE, W. J. SPILLMAN, and J. W. FROLEY (U. S. Dept. Agr., Bur. Plant Indus. Circ. 131, pp. 19-24, figs. 3).—This paper gives methods and formulas for measuring the volumes of hayricks and stacks, the heights of stacks and the number of cubic feet in a ton of hay. These methods were determined as the result of a study of the subject covering a period of several years and the actual measurements in 92 cases.

The improvement of small grains at Macdonald College, L. S. KLINCK (Proc. Amer. Soc. Agron., 4 (1912), pp. 126-129).—The author here describes the centgenet system employed in the improvement of cereals by selection.

As the result of 5 years' work with this system, from 500,000 single plants only the best from 116,000 planted in the spring of 1907 have thus far been tested side by side with the parent sorts. From 18 of the most productive varieties, representing 4 classes of wheat, 3 of barley, and 2 of oats, 37 strains have been isolated, which on an average of the last 2 years have yielded from 1 to 5 bu. per acre more than the parent sorts grown side by side with them.

"It is especially worthy of note that these average increases for 2 years were not obtained over the original, unselected parent stocks, but were obtained over original stocks, which have, for the past 5 years, been subjected annually to the most careful hand selection of heads in the field and of grain in the laboratory."

Methods of selection and choice of varieties in Russia, A. STEBUT (Jur. Russ. Selsk. Khoz. Gaz., 1912, Nos. 9, pp. 7-10; 10, pp. 7-10; 11, pp. 5-7; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 6, pp. 1301, 1302).—In this article the author gives 10 suggestions that should be observed in selection and improvement experiments with cereals by Russian investigators.

Crossbreeding experiments with oats and wheat, H. NILSSON-EHLE (Lunds Univ. Årsskr., n. ser., Sect. 2, 7 (1911), No. 6, pp. 3-56).—Earlier work on these experiments has already been noted (E. S. R., 26, p. 831). The author discusses the views of various investigators in regard to the two or more factors involved in modification and variation in crosses or hybrids, and presents additional evidence from his own researches to throw more light on the question.

The appearance of more than a single color factor in still other kinds and lines than heretofore observed was noted. It was shown that each of the white kernel individuals resulting from crossing 2 red kernel sorts possessed a red color factor. It was also absolutely proved that the truly outward characters of a pure line are constant, but not its gametic characters.

In a study of the length of internode in the wheat spike, compact spike Swedish varieties were crossed with longer spiked varieties. It was determined that the inherited gradations of a length character occurs through the various interaction of numerous Mendelizing factors, and that these factors are of 2 classes, one class working together as lengthening factors, and the other in the opposite direction as shortening factors. It was found that through the influence of an epistatic factor an apparently noncontinuous variation may be changed into the most delicate kind of continuous variation. A continuous inherited variation can occur therefore in different ways through the combination of Mendelizing factors. The formation of gradations which exceed the limits of the parents in crossing quantitative characters can be explained as resulting from new grouping of Mendelizing factors.

In 1904 the author observed a wide variation in the rust-resistant ability of certain similar crosses of wheat, and that this character seemed to segregate in

the hybrids in a similar manner to morphological characters. In 1908-9 crosses were made with various weak and strong rust-resistant wheats, and the results showed a complex segregation. As results through segregation into new gradations of resistance beyond the limits of the parents, lines both more or less resistant than the parents were easily discerned in the F_2 plat. Crosses between lines of somewhat similar or of only slight difference in rust resistance also gave transgressive segregation in the offspring. The complex segregation and the appearance of segregation in crosses of lines of similar resistance are explained by much independent evidence as the influence of Mendelian factors on the rust characters.

The inherited gradations of rust resistance to which different sorts and lines point indicate, therefore, no independent original variety, but different combinations of a number of factors whereby different combinations of factors can produce somewhat the same external resistance to rust. The new gradation occurred through various new combinations of factors, which are incited by crossing lines of different or somewhat similar rust resistance.

Collection and sowing of alfilaria seed, A. W. SAMPSON (*U. S. Dept. Agr., Rev. Forest Serv. Investigations*, 2 (1913), pp. 14-17).—The most effective method of collecting alfilaria seed was by picking it up by hand when the soil conditions and growth of other plants prevented the use of rakes. The best results were obtained by seeding 8 lbs. per acre on a well prepared seed bed in the fall and then covering lightly. It is noted that the seeds require special treatment and exposure to weather conditions in order to fit them for planting the same season they are gathered, as they have a thick, hard seed coat that retards germination.

Seed color in red clover, W. B. GERNERT (*Proc. Amer. Soc. Agron.*, 4 (1912), pp. 84-90, fig. 1).—In this paper the author describes his methods of propagating clover plants in order to study the lines of heredity in seed color. Plants with seed varying in color from yellow to purple were used. The results thus far obtained are discussed but no conclusions reached.

A study of red clover seed with relation to its color, J. F. EASTMAN (*Proc. Amer. Soc. Agron.*, 4 (1912), pp. 91-102).—This paper gives tabulated data and discusses the results of a series of investigations embodying "(1) a study of the location of the seed in individual heads with respect to weight, color, and inheritance of color; (2) the influence of soil fertility upon the proportions of dark and light colored seed; (3) a comparison of the apparent viability, weight, specific density, and composition of purple and yellow seed; (4) the location of the coloring matter in the purple seed and the effect of different solvents upon it; and (5) a comparison of the plants produced from purple and yellow seed."

The immediate effect on yield of crossing strains of corn, L. CARRIER (*Virginia Sta. Bul.* 202, pp. 3-11, figs. 2).—This bulletin gives the results of crossing different and unrelated strains of the same variety, by means of which the yields were increased up to 30 per cent in the same season. The varieties used were Leaming, Boone County White, and Collier Excelsior, the seed being obtained from Indiana, Illinois, Virginia, Nebraska, and Kentucky. Six thousand kernels of the crossed corn weighed 2,104 gm., as compared with 1,792 gm. from self-pollinated corn.

The practical application of this method of increasing yields is discussed.

The influence of width of rows on the yield and nutritive value of corn grown for fodder, S. WEISER and A. ZAITSCHEK (*Landw. Vers. Stat.*, 81 (1913), No. 1-2, pp. 49-68).—Rows were planted 80 cm. (31.5 in.), 60 cm., and 40 cm. apart. The wide spacing showed somewhat higher content of protein and crude

fiber than the close spacing. The total yield was influenced mostly by the weather conditions, for in a wet season the close planting yielded better and in a dry season the reverse was noted. Tabulated data of yields and analyses showing nutritive value and digestibility are given.

Experiments in the selection of maize in Russia, V. TALANOFF (*Jur. Russ. Selsk. Khoz. Gaz.*, 1912, Nos. 10, pp. 10-14; 11, pp. 7-10; abs. in *Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 6, pp. 1306, 1307).—This article mentions experiments to acclimatize and improve some American varieties of maize, as well as local varieties that have been conducted in 1911 and the 3 preceding seasons.

How to manage a corn crop in Kentucky and West Virginia, J. H. ARNOLD (*U. S. Dept. Agr., Farmers' Bul.* 546, pp. 7).—General directions for the production of a crop of corn in these States are given.

Report of the secretary, giving a brief history of corn improvement in Nebraska, E. G. MONTGOMERY (*Ann. Rpt. Nebr. Corn Improvers' Assoc.*, 1 (1910), pp. 109, figs. 21).—The first part of this report is a history of the Nebraska Corn Improvers' Association, which was organized in 1902, and of its cooperation with the corn trains, agricultural press, national corn shows, state board of agriculture, and the state experiment station. The second part gives the proceedings of the January, 1910, meeting and includes the addresses: Oats or What? by A. E. Nelson; The Wheat Crop, by E. G. Montgomery; and Saving the Corn Crop, by G. I. Christie; also plans for acre corn contests and 5-acre wheat contests, and the constitution and by-laws of the association.

Second annual report of the Nebraska Corn Improvers' Association, E. G. MONTGOMERY (*Ann. Rpt. Nebr. Corn Improvers' Assoc.*, 2 (1911), pp. 56, figs. 2).—This report gives the proceedings of the January, 1911, meeting, and relates the work of the association in connection with corn shows and contests.

Cotton problems in Louisiana, O. F. COOK (*U. S. Dept. Agr., Bur. Plant Indus. Circ.* 130, pp. 3-14).—This paper discusses the conditions and methods that would lead to the successful cultivation of long-staple varieties of cotton in Louisiana, and suggests the investigation of new long-staple varieties and improved cultural methods, the organization of cotton growing communities, the education of the consumer regarding the value of long-staple cotton, and the acclimatization of other tropical crops, as the chayote and dasheen, which could be used in rotation with cotton.

Annual report of the imperial cotton specialist, G. A. GAMMIE (*Rpt. Agr. Research Inst. and Col. Pusa [India]*, 1911-12, pp. 84-113).—This report contains discussions of the status of the cotton industry and of variety tests in 8 provinces in British India. Tables give cotton valuations furnished by the Bombay Chamber of Commerce and others for different periods of 1912.

Selection of flax in Russia, L. ALTHAUSEN (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 13 (1912), No. 2, pp. 161-184; abs. in *Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 9, pp. 1964-1966).—In several years of selection of flax with regard to length of stem, height of plant, thickness of stalk, mode of branching, and number of inflorescences, the lilac color of the petals point to a certain degree of stability in these characters. However, a type of medium height character segregated into high and low in 1909, the former ranging from 59.8 to 67.8 cm., the latter from 47.2 to 60.3 cm.

Hop investigations, H. V. TARTAR and B. PILKINGTON (*Oregon Sta. Bul.* 114, pp. 39).—This bulletin records the results of studies of special points relating to hop culture and ripening.

In a fertilizer test barnyard manure gave better results than commercial fertilizers, the latter proving unprofitable.

Little if any change was found in the composition of the hops when dried at a temperature of 145° F. The data as to the composition of hops at different stages of ripeness have been noted from another source (E. S. R., 28, p. 213).

Methods of hop analysis are described and discussed, including the method previously noted (E. S. R., 27, p. 814). Tables give results of analyses. It is noted that analyses have shown the Pacific coast hops to be equal to those of other countries.

Deficiencies in the present standards of judging hops are presented and the need of scientific standards that will determine the quantity of foreign matter and of soft bitter and hard resins is pointed out.

The effect of selection in pure-line oat work, F. A. SPRAGG (*Proc. Amer. Soc. Agron.*, 4 (1912), pp. 81-83).—This paper gives some tabulated data of 10 years of selection of oats, in which the line of descent passed through a selected individual plant in good and poor families. It was observed in general that the poor families remained poor and vice versa.

Experiments with *Phacelia tanacetifolia*, E. HAZELHOFF (*Fühling's Landw. Ztg.*, 62 (1913), No. 2, pp. 65-71).—It is stated that this plant is well known as a bee pasture plant and has been much recommended as a forage crop. In field culture it yielded 11,630 kg. per hectare (5.18 tons per acre), as compared with 3,074 kg. of Russian clover and 25,912 kg. of Northern French clover. Analyses showed these clovers to contain a lower percentage of ash than *Phacelia* and although the yields are smaller, it removes more mineral matter from the soil, especially than the Northern French clover. Complete analyses of *Phacelia* shortly before blooming, at the beginning of bloom, in full bloom, and in seed are reported.

Cultivation of the potato, E. GAUTHIER (*Rev. Inst. Agron. Montevideo*, 1911, No. 9, pp. 1-8).—This paper discusses the appearance and uses of the filiform (or male) potato plant, and gives as causes that produce it the use of aborted seed tubers, insufficient fertility of the soil, late planting, and premature harvesting. In a test it was found that sprouted tubers gave better results than those not sprouted. From a trial it was concluded that the continued use of seed tubers of a given strain did not diminish the value or yield of that strain.

Potato growing in New Jersey, W. B. DURYEE, Jr. (*New Jersey Stas. Circ.* 20, pp. 3-8).—This circular gives general directions for the production of potatoes in New Jersey.

On the classification of cultivated rice, S. KIKKAWA (*Jour. Col. Agr. Imp. Univ. Tokyo*, 3 (1912), No. 2, pp. 11-108, pls. 4).—This is an extended classification based upon its cultural characteristics, covering aquatic and upland, early and late, giant rice, salt rice, tall and short, awned and awnless, color of glume, stem, and leaf, and long-glumed and double rice; upon the utility of the grain, including nonglutinous and glutinous, long-grained and short-grained, large, medium, and small-grained, common and specially colored, and scented rice; and upon the shape of the hulled and unhulled grain, including white abdomened rice.

Selection and improvement of a wild *Solanum*, C. DENEUMOSTIER (*Bol. Dir. Fomento [Peru]*, 9 (1911), No. 10, pp. 1-15, pls. 16).—The author gives a brief history of the discovery of this wild potato and of its description by Dunal in 1850. Plant experiments were inaugurated in 1911, in which seed tubers varying in weight from 15 to 30 gm. were used. Tabulated results are given with discussions.

Varieties of sorghum for seed and forage, V. TALANOFF (*Jux. Russ. Selsk. Khoz. Gaz.*, 1912, No. 14, pp. 8-12; *abs. in Internat. Inst. Agr. [Rome]*, *Bull. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 6, pp. 1307, 1308).—In a trial of varieties for seed production a yield of 3,602 lbs. per acre was secured

in 1910 and 2,803 lbs. per acre in 1911, the starch content ranging from 60 to 64 per cent. The yield of green forage ranged from 7 tons 18 cwt. to 10 tons 13 cwt. per acre.

The soy bean in New Jersey, J. H. VOORHEES (*New Jersey Stas. Circ.* 21, pp. 3-8).—This circular gives the habits, characteristics, varieties, and uses of and directions for planting, cultivating, harvesting, and thrashing the soy bean under New Jersey conditions.

The variability of the nitrogen content of sugar beets, K. ANDELIK and J. URBAN (*Ztschr. Zuckerindus. Böhmen*, 36 (1912), No. 9, pp. 513-519, fig. 1).—Analyses of 100 sugar beets are reported, including beets produced from a mother beet of normal nitrogen content (0.18 per cent), and those from a mother beet rich in nitrogen (0.3 to 0.35 per cent).

The results showed that the nitrogen content varied in the normal class from 0.115 to 0.312 per cent, and in the class rich in nitrogen from 0.13 to 0.272 per cent. In the offspring of a single mother beet the nitrogen content seems to follow certain laws. With equal sugar content of individuals of the same class, the nitrogen content varied within its limits, except in cases of minimum and maximum nitrogen content. Similarly, the sugar content varied with equal nitrogen content, but the extremes in the variability of the nitrogen content were much greater than those of the sugar content within the same class. The nitrogen content varied to 75 per cent of the average, while the sugar content varied to only 17.5 per cent of its average. It seemed that the sugar and nitrogen content of any one class or family is not accidental but follows a certain law.

The selection of sugar cane with a view to regenerating and improving cane varieties, F. MAXWELL (*Bul. Agr. [Mauritius]*, 3 (1912), No. 27, pp. 685-695; *abs. in Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 6, pp. 1309-1311).—Three methods of selection are described, based upon the weight of cane, the sugar content, and the specific gravity of cane tops. It is noted that as a rule the heaviest stalks are the richest in sugar.

Sweet potato culture, W. B. KILLE (*New Jersey Stas. Circ.* 19, pp. 2-8).—This circular gives the methods used in the production of this crop at Swedesboro, N. J.

Tobacco breeding in Connecticut, H. K. HAYES, E. M. EAST, and E. G. BEINHART (*Connecticut State Sta. Bul.* 176, pp. 5-68, pls. 12).—This bulletin constitutes a report of progress in studying the fundamental principles involved in tobacco breeding, begun by the station in 1908 in cooperation with the Office of Tobacco Investigations of the U. S. Department of Agriculture and the Laboratory of Genetics of Harvard University.

The effects of inbreeding in a close fertilized species is discussed, and previous work on the effects of selection, inheritance of size characters, and tobacco breeding is cited. The 4 different types of commercial tobacco—viz, Broadleaf, Havana, Sumatra, and Cuban—that furnished the starting point for these investigations are described.

Reports are made on observations of 3 families—Havana × Sumatra and Sumatra × Havana, Sumatra × Broadleaf, and Havana × Cuban—in regard to quality of cured leaves, grain in tobacco leaves, texture, and inheritance of leaf number, shape, and size. The variety Halladay Havana was produced at will by crossing the Havana and Sumatra varieties. The relative values of experimental selections of this cross when compared with Havana, valued at 100, ranged from 74.2 to 162.6.

"The results obtained from the Broadleaf × Sumatra cross show that, as a rule, each character, such as leaf size, leaf shape, number of leaves, and type

of leaf, are inherited independently. Hence the difficulty of producing a uniform strain after crossing will depend largely on the gametic condition of the parents. If the parents differ in a large number of factors, the difficulties will be much greater than if there are but a small number with which to deal.

"The really important feature is that there is a segregation of quantitative characters in the F_2 generation of tobacco crosses and that some segregates will breed true in F_3 . As this is the case, there seems to be no need of using a different method when working with quantitative characters than for qualitative or color characters. Since quality of cured leaf depends on many factors, external as well as internal, it is probably unreasonable to expect a single external character to be closely correlated with quality, but as homozygosis produces uniformity in both quantitative and qualitative characters it must tend to produce uniform quality. The important matter in practice is simply to grow a sufficient number of F_3 and later generations to run a fair chance of testing out all the combinations of factors possible to the parental varieties used."

The results obtained in the Havana \times Cuban cross "show clearly that an external similarity of size characters in tobacco varieties does not necessarily mean a genetic similarity. . . . The general basis of the Mendelian conception of heredity depends on the fact that the somatic appearance of a plant is not a correct expression of its breeding nature. . . . That similar results are obtained when dealing with size characters, and that in both quantitative and qualitative characters it is impossible to know the germinal characters except by a breeding test seems further proof of the belief that both are inherited in a similar manner. The results of the sorting test of the parents and third generation crosses show that heterozygosis affects quality and that uniformity of external characters tends to produce uniformity of quality in the cured leaves."

"Our results show that the F_1 generations of size crosses in tobacco are as uniform as the parents and of an intermediate value; that there is an increase of variability in F_2 and where sufficient variates are studied, a range of variation equal to the combined range of the parents; that certain F_2 individuals breed true in F_3 , and that others give variabilities ranging in value from the parents to that of the F_2 generation. These results can be explained in essentially the Mendelian manner—by the segregation of potential characters in the germ cells and their chance recombination—therefore, from the plant breeding standpoint there seems good reason for believing that quantitative characters are inherited in the same manner as qualitative characters.

"The production of fixed forms which contain certain desirable plant characters is not, however, a simple problem, due to the large number of factors in which plants of different races differ and because a superficial resemblance does not necessarily mean a genetical resemblance. It is necessary to grow large F_2 generations and to save seed from those plants which most nearly conform to the desired type. Progeny of these F_2 plants should be grown in row tests in F_3 and selection continued in later generations until the desired form has been obtained. The length of time which it takes to produce a uniform type will depend largely on the number of varieties which can be grown in F_2 and the number of row tests which can be grown in F_3 .

"Quality of cured leaf is a complex character and due to many conditions, environmental as well as inherited. There is also the added difficulty that the quality of leaf must conform to the trade ideals. The experiments here reported indicate that a good quality of leaf can more generally be expected in a hybrid, if the parents are both of high quality, than if one parent is a good variety and the other somewhat lacking."

A bibliography is appended.

Wheat investigations, A. HOWARD (*Rpt. Agr. Research Inst. and Col. Pusa [India], 1911-12, pp. 31-46*).—This report includes results of trials of Pusa wheat in various parts of India, with tabulated data, and discusses seed distribution, cultivation experiments, and wheat breeding. The wheat yields varied from 645 lbs. per acre to 2,510 lbs. Methods of cultivation, curing, and breeding tobacco, and experiments with gram (chick pea) and various fibers are also discussed.

Tillering as a factor in determining the desirable qualities of winter wheats, A. E. GRANTHAM (*Proc. Amer. Soc. Agron., 4 (1912), pp. 75-81, fig. 1*).—In studying the relation of tillering to other characters of the wheat plant, the author here reports some results of cultural experiments in which wheat plants were grown on soils of different degrees of fertility and so placed as to allow of the free expression of the tillering character. Comparisons of observations recorded of the characteristics of these plants showed that tillering is apparently a varietal characteristic.

"With tillering there seems to be associated vigor and a capacity on the part of the plant for better development under unfavorable conditions. . . . An increase in the number of tillers per plant within a variety, as well as among varieties, is accompanied by higher yield per spike."

Determination of germination energy of seeds according to the average time required for germinating, G. D'IPPOLITO (*Staz. Sper. Agr. Ital., 45 (1912), No. 4, pp. 302-320; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 7, pp. 1535-1539*).—This paper discusses the methods usually employed and the unsatisfactory results obtained thereby, because high germination capacity may be accompanied by low germinating energy. The author proposes that germination energy be determined not only on the basis of the percentage of seeds which sprout within a determined time, but also on the mean time required for germination, as calculated by a method which he describes.

Results of this method applied to germinating tests of seeds of white, red, and crimson clover, alfalfa, sainfoin, sulla, bird's-foot trefoil, fenugreek, vetches, maize, rye grass, wheat, oats, rice, hemp, and beets are reported.

Studies of the wild oat, W. M. ATWOOD (*Abs. in Science, n. ser., 37 (1913), No. 949, p. 380*).—In studying the germinating qualities of *Avena fatua* it was found to possess high vitality. It germinated poorly after harvest, but the percentage of germination increased steadily up to the succeeding spring and summer. The early delay in germination appeared to be due neither to the chemical condition of the embryo nor to coat obstructions to water entry, but rather to the supply of oxygen.

Controlling Canada thistles, H. R. COX (*U. S. Dept. Agr., Farmers' Bul. 545, pp. 14, figs. 6*).—Aside from giving the range, description, and methods of distribution, the author describes the successful experience of an Ohio farmer with methods of eradicating the weed which consist essentially in keeping the tops cut at or below the ground.

HORTICULTURE.

Respiration of fruits and growing plant tissues in certain gases, with reference to ventilation and fruit storage, G. R. HILL, Jr. (*New York Cornell Sta. Bul. 330, pp. 377-408*).—In this bulletin the author briefly reviews some of the literature of the important phases of anaerobic respiration, together with some current theories offered in explanation of it and of its relation to aerobic respiration. Experimental studies of the production of carbon dioxide in hydrogen, in nitrogen, and in air by ripe cherries, blackberries, green peaches, ripe

grapes, and germinating wheat are then reported, together with a study of the metabolism and keeping quality of various fruits in nitrogen, hydrogen, carbon dioxid, and air.

The author's studies as a whole are summarized as follows: "The respiration of ripe fruits, as well as that of green fruits, is rapid. The anaerobic production of carbon dioxid by ripe cherries, blackberries, and grapes is as rapid as the aerobic production for a considerable length of time. Ripe fruits that spoil quickly, such as cherries, have a higher respiratory rate than those that do not spoil so quickly, such as grapes. This is due, possibly, to a higher enzym content.

"Fruit tissues that respire as actively anaerobically as aerobically seem to be those that have finished their growth and are ripe. Growing tissues, such as green peaches and germinating wheat, respire more than twice as rapidly aerobically as anaerobically. The activity of the protoplasm would seem to be connected with this more direct use of oxygen in the production of carbon dioxid. If growing tissues, such as green peaches, are placed in an oxygen-free gas for a few days and then brought back into air, the rate of production of carbon dioxid does not entirely return to the normal. This would indicate a permanent injury to the protoplasm or to some of the enzymes, due to insufficient oxygen.

"Ripe apples lose their color, texture, and flavor, and take on the qualities of half-baked apples by being kept for a sufficient length of time in oxygen-free gases. This emphasizes the need of good aeration for apple. The softening of peaches seems to be decreased greatly by carbon dioxid and to a considerable extent by hydrogen and nitrogen. Peaches become brownish and acquire a very bad flavor when oxygen is withheld from them. 'Ice scald' seems to be injury due to insufficient oxygen and to an accumulation of carbon dioxid within the paper wrappers in which peaches are so often shipped. With good ventilation in conjunction with good refrigeration such injury may be greatly reduced. This applies to fruits in storage as well as to those in transit. Good ventilation in conjunction with refrigeration is of prime importance for the successful storage of fruit."

A bibliography of cited literature is appended.

The application of nitrogen in relation to fruit-bud formation, T. REMY (*Mitt. Deut. Landw. Gesell.*, 28 (1913), No. 29, pp. 416-421, figs. 5).—In connection with a study of the relations existing between fertilizers applied to fruit trees and the nutritive content of the various organs of the trees, studies were conducted with dwarf pears and apples during the period 1907-1911. One row of trees received a complete fertilizer. In other rows nitrogen, potash, phosphoric acid, and lime, respectively, were withheld. In the case of pears an unfertilized row was also included.

Observations, as made for each season, indicate that the application of a certain amount of nitrogen is necessary for the abundant development of fruit buds. An analytic study of the dry substance of the leaves shows a perceptible relation between the nitrogen content of the leaves and the amount of nitrogen applied to fruit trees. Although this relation was somewhat variable, results indicate that with both pears and apples a nitrogen content of less than 1.25 per cent of the dry substance of the leaves during the fruit ripening period is insufficient for the abundant setting of fruit buds. The ratios between the various nutritive elements appear to exert some influence on fruit-bud development, although this influence can not be shown. In the rows where nitrogen was withheld the phosphoric acid content of the leaves was higher.

Although in the present experiments no relations were detected between the amounts of potash, phosphoric acid, and lime applied and the amounts of these

substances in the leaves, the author points out that the value of these elements in the fertilization of fruit trees should not be disregarded. The importance of these elements is apt to be more noticeable as the amounts present approach the minimum limit. On the other hand, no injurious effect on flowers and fruit formation was noted from the presence of a high content of potash, phosphoric acid, and lime.

The work of the Umatilla Experiment Farm in 1912, R. W. ALLEN (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 129, pp. 21-32, figs. 4*).—The work of the Umatilla Experiment Farm is mainly horticultural. The experiments in progress during 1912, which are here briefly described, consisted in the testing of fruit varieties and methods of production; the identification and testing of varieties of garden and truck crops; experiments with methods of increasing the supply of organic matter in the soil, including tests of several green manure crops; variety tests for numerous hardy shrubs and trees suitable for ornamental purposes and as windbreaks; and tests of different irrigation methods.

The selective improvement of the Lima bean, G. W. SHAW (*California Sta. Bul. 238, pp. 581-590*).—In continuation of a previous report (*E. S. R.*, 26, p. 539) data are given showing the performance record in 1911 and 1912 of several strains of Lima beans which were selected for increased yield.

The results of the work as a whole have shown that higher yielding types of Lima beans than those now used by growers may be obtained simply by seed selection but better by plant selection in the field. During the 4-year period 1909-1912 an average increased yield of 19.89 per cent has been secured with the station's selected strains. One of these strains gave an increase of 160 per cent. In addition to the factor of increased yield it is believed there is a definite possibility of improvement in earliness, hardiness, alkali resistance, and quality, especially if the individual plant is made the unit of selection and the progeny of each plant is tested separately.

The culture of tomatoes in California with special reference to their diseases, S. S. ROGERS (*California Sta. Bul. 239, pp. 591-617, figs. 13*).—The first part of this bulletin discusses tomato culture with reference to seed selection, seed beds, field culture, harvesting, market requirements, cost of production and profits, and varieties. The various diseases of the tomato are then considered relative to their appearance, causes, and control. The bulletin concludes with a brief account of the development of the tomato industry in the United States and in California.

Tomato culture in Idaho, W. H. WICKS (*Idaho Sta. Bul. 76, pp. 54, figs. 13*).—This bulletin contains the results of 3 years' experimental work in tomato culture at the station, together with detailed cultural suggestions based on this work as well as on information secured from tomato growers and canning companies of the State.

Experiments were started in the spring of 1910 to determine the best methods of planting, cultivating, pruning, training, and marketing the tomato under local conditions. Sparks Earliana, New Stone, and Dwarf Champion varieties were used in the work. Some of the tomatoes were staked, others were grown on trellis, and still others were left untrained on the ground. In each of these divisions plants were pruned to 1, 2, and 3 stems, and checks were left unpruned. None of the plants was topped.

The hotbed method of raising plants was the most economical, and was otherwise satisfactory, the average cost of producing enough plants for 1 acre by this method being \$9.35. The average cost per acre for planting was \$7.27. The cost of staking, including stakes and labor, was \$42.57 per acre and the cost of trellising was \$70.58 per acre.

In the matter of hastening maturity the stake method of training was first, the trellis method second, and no training third. Pruning and training tended to reduce the number of decayed and cull tomatoes, but the highest yields were secured where no pruning was done. The plants which were grown on trellis and received no training gave the highest number of boxes of all grades, but the cost of trellising reduced the net profit from this system of training below that received for the fruit grown on plants that were unpruned and untrained.

In general the yield and net profit per acre were the smallest when plants were pruned to 1 stem and increased in both yield and profit as the amount of pruning decreased, all of the plants having been set 4 ft. apart each way. The average price per box received for each grade of tomatoes, as a whole, was used in estimating the gross returns from the crop on each plot.

The pollination of the pomaceous fruits.—I, Gross morphology of the apple, E. J. KRAUS (*Oregon Sta. Research Bul. 1, pt. 1, pp. 12, pls. 7*).—In a proposed study of the pollination of pomaceous fruits the author has selected the apple as the first fruit to be considered. In the present paper, which deals primarily with the gross morphology of this fruit, the origin and development of the several parts of the blossom are considered in detail, the subject matter being accompanied by a series of plates. A bibliography of cited literature is included.

Thinning apples, L. D. BATCHELOR (*Utah Sta. Circ. 12, pp. 2-8*).—The author here calls attention to the importance of thinning the fruit as a means of producing the maximum number of first-class apples and gives some data on thinning experiments conducted with the Ben Davis and Jonathan varieties in 1911 and with Jonathan and Gano trees in 1912.

Eight-year-old Ben Davis trees with the fruit thinned to a minimum distance of 4 in. apart gave a net increase per tree of \$1.16 as compared with unthinned fruit. The Jonathans showed a net increase of 30 cts. per tree. The same Jonathan trees thinned in the same manner in 1912 gave a net increase of 71 cts. per tree over unthinned trees. In practice the cost of thinning appears to be offset by the reduced cost in sorting when the fruit is packed.

The peach, A. Z. SALVADORES (*Bol. Min. Agr. [Buenos Aires], 15 (1913), No. 4, pp. 399-429, pls. 17, figs. 33*).—A monograph on the peach in which are discussed its botany, the culture and care of peaches, harvesting, marketing, insect pests and diseases, and varieties adapted for Argentina.

Oriental pears and their hybrids, H. R. COX (*New York Cornell Sta. Bul. 332, pp. 445-486, figs. 18*).—This bulletin comprises a study of the cultivated varieties of the Oriental pear (*Pyrus sinensis*) and more especially of the hybrids between the Oriental and the common, or European pear (*P. communis*), with special reference to their value for the pear industry of New York State, and also to ascertain whether the Kieffer and its allies in this group of pears can be satisfactorily utilized as stocks for the top grafting of the European varieties and their descendants.

The data here presented are based upon observations covering about 25 years, made by Bailey, Craig, the author, and others connected with horticultural work at Cornell University. The subject matter is discussed under the following general headings: Position of Orientals among cultivated pears in this country; botany and early history; appearance of the hybrids; status in the pomology of the United States, including importance of the hybrids in the pear-growing industry of the country, statistics of pear growing in 1890, 1900, and 1910, decrease in number of trees of bearing age, increase in production, range of adaptability, conditions affecting quality, yields and profits, picking, marketing, cold storage, packages, and canning and evaporating; culture; self-sterility; enemies; and variety descriptions.

The investigation appears to throw serious doubt on the advisability of top-working previously planted orchards of Kieffer, Garber, and other Oriental hybrids with slow-growing varieties of the European strain. Partial or complete failure has usually followed such attempts. A limited amount of evidence is found in favor of Kieffer as a stock for Bartlett, which, like the former variety, is a vigorous grower. The presumption is strong that the grafting must be done with great care and at a comparatively early period in the life of the stock.

The evidence shows strongly that the Oriental group of pears is not well adapted for general culture in New York State, although many orchards have been successful and profitable. These pears attain their highest development in the South Atlantic and Gulf States, where they are seldom fatally attacked by blight or San José scale.

The fibro-vascular system of the quince fruit compared with that of the apple and pear, D. MCALPINE (*Proc. Linn. Soc. N. S. Wales*, 37 (1912), pt. 4, pp. 689-697, pls. 3).—A detailed study of the structure of the mature quince in which the author compares the fibro-vascular system of the quince with that determined for the apple and pear in previous investigations (E. S. R., 27, p. 538). A number of illustrations of various phases of the vascular system are included.

Sites, soils, and varieties for citrus groves in the Gulf States, P. H. ROLFS (*U. S. Dept. Agr., Farmers' Bul.* 538, pp. 15).—This contains brief and concise directions for the choice of the proper sites, soils, and varieties for citrus orchards in the Gulf States, and is a revision of one part of the material formerly published in *Farmers' Bulletin* 238 (E. S. R., 17, p. 767).

Propagation of citrus trees in the Gulf States, P. H. ROLFS (*U. S. Dept. Agr., Farmers' Bul.* 539, pp. 16, figs. 9).—A revision of that part of *Farmers' Bulletin* 238 (see above) dealing with the methods of propagating citrus trees and the most important nursery practices. It also discusses the choice of suitable stocks for different regions.

Culture, fertilization, and frost protection of citrus groves in the Gulf States, P. H. ROLFS (*U. S. Dept. Agr., Farmers' Bul.* 542, pp. 20, figs. 3).—A revision of that part of *Farmers' Bulletin* 238 (see above) dealing with planting and cultural operations in a citrus orchard.

Pruning frosted citrus trees, J. E. COIT (*California Sta. Circ.* 100, pp. 4).—This circular contains practical directions for re-heading both young and mature citrus trees which have been more or less seriously injured by frost.

The present status of date culture in the Southwestern States, W. T. SWINGLE (*U. S. Dept. Agr., Bur. Plant Indus. Circ.* 129, pp. 3-7).—The author describes the progress thus far made in the development of the date industry in the Southwest and offers numerous suggestions to growers relative to the further conservative development of the industry.

It is concluded in substance that date growing is an unusually difficult branch of fruit culture which is most promising to the small resident owner, who, by experimenting with seedling dates and a small planting of offshoots, has acquired the necessary experience to enable him to care for young date palms efficiently. Commercial plantings should be made only of tested standard varieties, such as Deglet Noor, Tazizaoot, Birket el Haggi, and possibly one or two other varieties. The use of a wrong variety entails great loss, since the trees can not be budded or grafted over into better varieties.

Pecan culture in Florida (*Fla. Quart. Bul. Agr. Dept.*, 23 (1913), No. 3, pp. 123-153).—A popular treatise on pecan growing, largely adapted from *Florida Station Bulletin* 85 (E. S. R., 17, p. 1158), but including also information secured from various expert pecan growers.

The organization of a fruit distributing system, J. A. REID (*Utah Sta. Circ. 11*, pp. 124-136).—This comprises an analysis of the California Fruit Growers' Exchange, including a statement of the difficulties encountered in organizing the exchange and suggestions relative to the development of a co-operative selling organization in Utah.

The home preparations of lime and sulphur mixtures, A. J. FARLEY (*New Jersey Stas. Circ. 24*, pp. 3-8).—This circular contains practical directions, based on the latest scientific knowledge as well as on actual experience, for the home preparation of both concentrated lime-sulphur and self-boiled lime-sulphur.

British violets, MRS. E. S. GREGORY (*Cambridge, England, 1912*, pp. XXIII+108, pls. 4, figs. 28).—A monograph on the British forms of the genus *Viola*. The descriptions given are based on studies of herbarium sheets and also on living specimens, both in the field and in cultivation. A bibliography of consulted literature is included.

FORESTRY.

Review of Forest Service investigations (*U. S. Dept. Agr., Rev. Forest Serv. Investigations, 2* (1913), pp. 92, pls. 5).—The present number comprises the following papers and those noted on pp. 531, 533, 543, and 570).

Biennial fructification of Alaska cypress (*Chamæcyparis nootkatensis*), G. B. Sudworth (pp. 7, 8).—Recent investigations by the author show that this species requires 2 years to mature its fruit.

Relation of grazing to timber reproduction, A. W. Sampson and W. A. Dayton (pp. 18-24).—The study here reported was started in the spring of 1911 on the Shasta National Forest to determine from a silvicultural standpoint the amount and seriousness of injury due to grazing cattle, goats, and sheep; the season of greatest injury; the relative damage to the various economically important tree species; the actual extent of injury from both browsing and trampling; and under what conditions grazing may aid forest reproduction. A count made at the beginning of the 1912 grazing season showed that out of the total of 11,040 seedlings and saplings under 5 ft. 6 in. in height 1,822 were grazed, 161 were trampled, 3 killed by stock, and 152 killed by agencies other than stock. From the study thus far made the only cases of serious injury from the silvicultural standpoint have been found on the goat and sheep ranges. The work is to be continued.

Eradication of chaparral by goat grazing, J. H. Hatton (pp. 25-28).—The experiment here reported was started in the Lassen National Forest in 1909 for the purpose of determining the practicability of using goats in exterminating chaparral where the manzanita makes up a large portion of the brush, the ultimate aim being to prepare the areas for artificial or natural reproduction. While the results are not conclusive from a scientific standpoint, the conclusion reached is that the experiment is not practical. Although goats, if confined and starved to it, will destroy almost any type of brush, considerable injury is apt to be done to seedlings hidden through the brush, and the desired results in brush extermination do not compensate for the loss in growth and condition of the goats.

A microscopic study of the mechanical failure of wood, W. D. Brush (pp. 33-38).—The present study is a part of the general problem of the correlation of the microscopic structure of wood with its physical and mechanical properties which the Forest Service is investigating. The material and methods of study are described, and consideration is given to the failure of wood fibers under compression parallel with the fibers, longitudinal shear, tension, compression across the fibers, and bending; relation of thickness of fiber walls to manner of failure under compression parallel with the fibers and longitudinal

shear; and the effect of moisture content on failure under compression parallel with the fibers and longitudinal shear.

Wood fuel tests, H. S. Betts (pp. 39-42).—The results are given of an investigation to determine with the bomb calorimeter the heating values of 10 different species of woods, commonly used for fuel in New Mexico and Arizona.

The markets for the products of the hardwood distillation industry, R. C. Palmer (pp. 43-48).—This paper comprises a summary of statistical data gathered from about 60 wood distillation plants with reference to the quantity of standard or other products produced annually, the average selling price at the plant, and the industries that use the products and the proportion going to each. The data, although not complete, show in general the status and extent of the industry and the important markets for its products.

The germination of alligator juniper seed, H. C. Turner (pp. 49-52).—The essential features of the method described consist in stratifying the seed over winter to promote germination the first season and in sanding the surface of the seed bed to prevent the soil from crusting in hot weather after being watered.

Effect of source of seed on results in yellow-pine reforestation, W. D. Hayes (pp. 53-57).—The experiment here described was started at the Fremont Station in 1910 to determine the relative germination and rate of growth of seedlings and nursery stock of yellow pine from seed obtained in the north range, south range, and middle range of the species when sown and planted on situations of different heat and moisture qualities at the middle of the range. The greatest germination was shown by local seed and the poorest by northern seed. The northern seed, however, produced the greatest number of hardy plants; the weakest plants were produced by the southern seed. The seed from the southern part of the range showed a rather marked tendency to lie over and germinate the second season. From the tests thus far made it is concluded that shipments of yellow-pine seed from one latitude to another should be avoided. The experiment is to be continued to study the effect of smaller latitudinal differences in the source of the seed on both the germination and survival and the qualities of the trees produced.

Methods and seasons for yellow-pine reforestation, W. D. Hayes (pp. 58-60).—The experiment here described was begun at the Fremont Station in the winter of 1909-10 for the purpose of determining the best method and season for yellow-pine reforestation on typical ground for this species. The following methods were tried: Broadcasting without preparation of the soil, broadcasting after thorough harrowing of the soil, corn planter sowing, and sowing in prepared seed spots of about 1 ft. diameter and a depth of 3 in. Stock was also planted direct from the nursery and transplanted from pots.

Considering the cost of each tree the least expensive method of obtaining a stand is by spring seed spots; next in order come summer broadcasting on harrowed ground; and third, the spring planting of sturdy nursery stock. The experiment is to be continued.

Planting western yellow pine, G. A. Pearson (pp. 61-65).—Because of the uniform failures in planting western yellow pine in the general region of the Fort Valley Station an experiment was conducted to determine the possibilities of improvement by using the best available stock and the best known methods. The results indicate that by the use of good vigorous stock planted early in the spring western yellow pine can be successfully established in the region. No conclusions are drawn as to different methods of preparing the planting holes.

Seed spotting Douglas fir under aspen, N. W. Scherer (pp. 66, 67).—This comprises a preliminary report on a study of the seed-spot method of establishing Douglas fir under aspen.

Methods and seasons for Douglas fir reforestation, W. D. Hayes (pp. 68-70).—This experiment is similar to the one above noted for yellow pine reforestation. Although no definite conclusions are thus far drawn, the results indicate that wherever possible summer broadcasting on harrowed ground is the cheapest method for obtaining a stand of Douglas fir in the front range of the Rocky Mountains. However, since this method produced only about 1,600 trees per acre when seed was used extravagantly, it is considered doubtful if the results justify the expense. Studies of various methods of reforestation are to be continued on typical Douglas fir types.

Yellow pine habitat extension, W. D. Hayes (pp. 71-73).—The experiment here reported was begun at the Fremont Station in 1911 to determine the possibility of artificially extending the natural habitat of yellow pine downward into the zone naturally occupied by relatively worthless species, such as piñon, juniper, and chaparral oaks.

From the results so far obtained it is concluded that sowing seed and planting any but the very hardiest stock on such a site are futile. Hardy, well-developed transplants, preferably 3 years old, can be planted in the piñon type with good chances of success. Although these results were secured during a season very deficient in precipitation, it is recommended that yellow pine planting should be confined to the higher and moister sites until further studies have been conducted in the low dry sites.

Douglas fir habitat extension, W. D. Hayes (pp. 74-77).—In this experiment the author is attempting to determine whether Douglas fir can be successfully grown at altitudes above its natural zone in a second quality Engelmann spruce site, where the original stand has been destroyed by fire. The results as derived from 2 seasons' work indicate that Douglas fir can be successfully started in the Engelmann spruce-limber pine type. No conclusions are thus far drawn as to method and season of planting, although it is felt that fall work, both in seed sowing and in planting operations, will be more successful at high altitudes than at lower ones on account of the greater protection given the seeds and plants by frozen ground and the blanket of snow throughout the trying winter season.

Brush disposal, G. A. Pearson (pp. 78-81).—The object of this study was to determine the effects upon reproduction of scattering the brush after logging in a western yellow pine stand. The experiments, which were conducted during the period 1909 to 1911, inclusive, indicate that a brush cover acts as a detriment rather than a benefit to reproduction, at least during the first few years after it has been scattered since it prevents the seed from reaching the soil. It is suggested, however, that this disadvantage may be offset in later years by the benefit which the decayed vegetable matter will have upon the soil. When the brush is to be scattered over the stand, provision can be made for seeding by leaving alternate bare spots or strips from 6 to 12 in. wide between the branches.

Methods of combating seed-destroying animals, G. A. Pearson (pp. 82-85).—The experiments here described were conducted during 1909-1911, principally in the Coconino and Gila National Forests, although observations were made in other forests. Treating the seeds with red lead was found to be ineffective. It seems probable that by distributing poisons very systematically over a sufficiently large area rodents can be exterminated. This method does not appear to be successful against birds. Screens proved effective against both birds and rodents but are considered impractical at present on account of the cost.

Influence of birds and rodents in reforestation, W. D. Hayes (pp. 86-92).—From the results of the present experiment, which was conducted in an open

stand of yellow pine during the seasons of 1910 and 1911, it appears that poisoning is not financially advantageous and that it would be better to sow more heavily on unpoisoned areas, allowing for a certain loss by birds and rodents. The cost of absolute protection afforded by wire screens was prohibitive.

Sixth report of the state forester of Connecticut for the year 1912, W. O. FILLEY (*Connecticut State Sta. Rpt. 1912, pt. 6, pp. 455-531, pls. 6*).—This report comprises a résumé of the work of the forestry department in all lines since its establishment. Records are given of forest fires occurring in 1911 and 1912, together with a summary of forest fires for the period 1905 to 1912. Operations on the state forests and forest plantations are reviewed and suggestions are given relative to methods of increasing the forest resources of the State.

The report concludes with a paper by S. N. Spring on Forest Planting in Connecticut. This paper shows the progress which has been made in forest planting in that State since 1901, and also contains suggestions relative to the establishment and care of forest plantations.

Growing forest trees in western Nebraska.—Shrubs and ornamentals, W. P. SNYDER (*Nebraska Sta. Bul. 137, pp. 3-26, figs. 17*).—Part 1 of this bulletin describes experiments which have been conducted at the North Platte Substation for several years to determine whether trees can be grown successfully without irrigation on western Nebraska table-land under conditions which obtain at the station.

Plantings of nearly 30 species in plats of about 1 acre each were started in 1907. Each kind has been tried on both bench and table-land, the number of each species varying from 200 to 1,000 or more. At the end of the 5-year period the most promising deciduous trees are cottonwood, Carolina poplar, Norway poplar, box elder, honey locust, hackberry. American elm, Russian olive, and black walnut. The least promising deciduous species are black locust, catalpa, Osage orange, Russian mulberry, green ash, and Russian golden willow. With one exception the results with conifers have been quite discouraging. The best results were with 50 Black Hills spruce which were set out in 1908. Of these nearly every one is living and making a fair growth.

An account is given of the methods of establishing and caring for these plantations, together with suggestions to persons planting trees.

Part 2 of this bulletin briefly discusses the importance of fruits and ornamentals on the farm, and gives some information relative to sorts which are adapted for the North Platte region.

An extraordinary phenomenon in a mahogany (*Swietenia mahogani*) seedling, M. RAMA RAO (*Indian Forester, 39 (1913), No. 7, p. 327*).—The phenomenon here noted consists of a mahogany seedling barely 10 months old which produced normal and complete flowers.

So-called "osage orange rubber"—a product of Kansas, C. P. Fox (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 25 (1912), Sects. I-Ve, pp. 593-596*).—The fruit of the *Toxylon pomiferum* grown in Ohio was examined as regards a possible source of rubber. The resin obtained resembled a decomposition product of rubber, and it is thought that possibly the fruit grown in the southern part of Kansas may produce a true rubber.

DISEASES OF PLANTS.

Plant diseases, W. F. BRUCK, trans. by J. R. AINSWORTH-DAVIS (*London, Glasgow, and Bombay, 1912, pp. 152, pl. 1, figs. 45*).—In this book descriptions are given of some of the more important diseases attacking cultivated plants, and special emphasis is laid on the pathological modifications of the plant body

due to the presence of parasites. The life histories of pests are treated with only the detail necessary for their recognition in the course of the disease. The main portion of the book is taken up with descriptions of diseases of cereals and other field crops, vegetables, fruit trees, vines, forest trees, etc. In conclusion a chapter is given on the treatment of plant diseases, formulas being given for the preparation of fungicides and insecticides.

Recent researches on *Citromyces*, G. BAINIER and A. SARTORY (*Bul. Trimest. Soc. Mycol. France*, 29 (1913), No. 1, pp. 137-161, pls. 2).—This discussion includes the study of the characters and culture of the following species of *Citromyces* claimed to be new: *C. minutus*, *C. ramosus*, *C. ceciae*, *C. musae*, and *C. cyaneus*.

Notes on plant diseases of Connecticut, G. P. CLINTON (*Connecticut State Sta. Rpt.* 1912, pt. 5, pp. 341-358, pls. 4).—The author discusses the occurrence of plant diseases in Connecticut during the seasons of 1911 and 1912 and notes a number which have not been previously reported in the State or which are reported on new hosts. Among these are the orange rust of the apple (*Rastelia aurantiaca*), banana anthracnose (*Glæosporium musarum*), bacterial rot of cabbage (*Pseudomonas campestris*), pine rust of black currants (*Cronartium ribicola*), damping off (*Rhizoctonia* sp.) and sun scorch of evergreens, powdery mildew of hops (*Sphaerotheca humuli*), rust of Chinese juniper (*Gymnosporangium japonicum*), grain smut of Kafir corn (*Sphacelotheca sorghi*), stem canker of peaches (*Phoma persicæ*), stem canker of pines (*Phoma* sp.), rusts of pines (*Peridermium delicatulum* and *P. pyriforme*), fruit spot of quince (*Cylindrosporium pomi*), crown gall of roses (*Bacterium tumefaciens*), *Phoma* rot of swedes (*P. napobrassicæ*), and crown gall of Chinese wistaria (*B. tumefaciens*).

Report of the station for plant pathology, G. LÜSTNER (*Ber. K. Lehranst. Wein, Obst u. Gartenbau Geisenheim*, 1911, pp. 112-161, figs. 17).—An account is given of some after results of the previous year's inundation of the Rhine, such as death of maple and plum trees; of injuries due to late frosts, as observed in case of apple, pear, raspberry, elder, grape, etc.; of sunburn on cherries; of losses due to sprays, and to weather, including lightning, drought, and wind; the larger part being devoted to animal injuries and protection therefrom.

Observations and studies on injuries to vegetation in Ratibor-Plania, R. OTTO (*Ber. K. Lehranst. Obst u. Gartenbau Proskau*, 1911, pp. 64-66. In *Landw. Jahrb.*, 43 (1912), *Ergänzungs.* 1).—In this part of a more general report the author states that the injuries to vegetation in the neighborhood of chemical works were most marked to the leeward of the works but that climatic and other causes involved also caused injury to vegetation.

[Plant diseases in Southern Nigeria], F. EVANS (*Ann. Rpt. Agr. Dept. South. Nigeria*, 1912, pp. 6-9).—This is compiled from the report of C. O. Farquharson. Two root diseases of *Hevea brasiliensis* are noted, *Fomes semitostus* and *Hymenochate noxia*. Of these the former (also called *Polyporus lignosus*) is able to advance through the soil and reach other trees near by. It also grows on decaying stumps, and one case has been reported of its occurrence on cacao. The latter fungus was found to be about as frequent and destructive as the former, and, moreover, to be not uncommon on cacao trees in the colony.

Pink disease (*Corticium salmonicolor*) is said to be common in the Sapele district, the trees being most commonly attacked at the forks. The whole crown often dies. It is believed to be independent of wounding in its attack on the trees.

Cacao is reported to be attacked also by canker ascribed to *Phytophthora faberi* or *Spicaria colorans*. Very similar effects are produced by another

fungus for which the life history has not yet been worked out. Two pod diseases, *Thyridaria tarda* and *Nectria bainii*, have been noted, also a pod anthracnose provisionally taken to be *Colletotrichum theobromicolum*.

Cotton seedlings are attacked with sore shin, which is thought to be a physiological disease. The same view is held in regard to red rust, affecting markedly American cotton and Agege cotton, which is considered to have a strain of American descent. Selection of resistant varieties is recommended. Cotton anthracnose, due to *Colletotrichum gossypii*, attacks mainly the fruits but also the stems. The *Diplodia* found causing a boll rot is regarded as identical with one on cacao pods. Rust caused by *Uredo gossypii* is widespread throughout the colony. Both forms of native cotton, the green seeded and the naked seeded, are affected by leaf curl which is considered as a physiological abnormality. Another disease, almost peculiar to native cottons but occurring also on Brazilian cotton, is characterized by a blackening of the midrib and larger veins of the leaves. Its origin is not known.

Like the American cottons the native varieties are subject to rust, mildew, anthracnose, etc. Later in the season native cottons show a peculiar black color on the branches, the cause of which has not been investigated.

Comparison of plant and animal tumors, P. VUILLEMIN (*Biologica*, 3 (1913), No. 28, pp. 101-109, figs. 9).—The author discusses the characters of several kinds of internal or external enlargements and distortions noted in different plant structures due to various causes, including bacteria, nematodes, etc., pointing out some resemblances and differences noted in comparison of these with animal tumors.

Experiments on loose smut of grains, O. APPEL and E. RIEHM (*Mitt. K. Biol. Anst. Land u. Forstw.*, 1912, No. 12, pp. 9-14).—Continuing previous reports (E. S. R., 26, p. 546), the authors submit results obtained by soaking wheat in mercuric chlorid solution, showing no beneficial results with 1 per cent but complete sterilization of the seed at 2 per cent applied for 3 hours. The hot-water treatment found best adapted to the treatment of seed grain was from 6 to 8 hours at 27° C. and then from 10 to 20 minutes at 50 to 52°. It was found that the immersion in loose sacks preliminary to the hot-air treatment need not be prolonged more than 1½ or 2 hours when water to about 16 per cent of the seed weight has been absorbed. If the grain be now removed from the water, covered over night with sacks in a room at 25°, and then put through a well-ventilated drying apparatus at 50° for 5 minutes, the water content is reduced to 12 per cent of the seed weight without injury to the grain, which is practically sterilized.

A disease of rice, N. NOVELLI (*Gior. Riscolt.*, 2 (1912), No. 15, pp. 226-228, fig. 1; abs. in *Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 10, p. 2303).—An account is given of the malformation and stunting of 2 varieties of rice in the Province of Pavia, Italy, resulting in the failure of nearly all grains to germinate and in the reproduction of the trouble to a less degree in those that sprouted. The trouble is ascribed to faulty assimilation, but further investigations are promised.

Phytophthora parasitica n. sp., a new disease of the castor oil plant, J. F. DASTUR (*Mem. Dept. Agr. India, Bot. Ser.*, 5 (1913), No. 4, pp. 177-231, pls. 10; abs. in *Agr. News [Barbados]*, 12 (1913), Nos. 293, pp. 238, 239; 294, pp. 254, 255).—A description is given of the disease of the castor oil plant in which both seedlings and the leaves of older plants are destroyed by a fungus which has been isolated and described as *P. parasitica* n. sp.

Sclerotinia on clover seed, R. LAUBERT (*Mitt. K. Biol. Anst. Land u. Forstw.*, 1912, No. 12, pp. 17, 18; abs. in *Mycol. Centbl.*, 1 (1912), No. 11, p. 372).—The author reports that sclerotia found in clover seed produced apothecia clearly

differentiated from those of *S. trifoliorum*. The fungus, which is described, is thought to represent a new species.

Diseases of ginseng, A. VUILLET (*Jour. Agr. Trop.*, 13 (1913), Nos. 141, pp. 78, 79; 142, pp. 110-112).—Among the diseases and enemies discussed, with remedies prescribed, are *Alternaria panax*, *Theilavia basicola*, *Sclerotinia libertiana*, *S. panacis*, *Phytophthora cactorum*, *Pythium debaryanum*, a *Rhizoctonia*, and *Heterodera radiculicola*.

Investigations on potato diseases (fourth report), G. H. PETHYBRIDGE (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 13 (1913), No. 3, pp. 445-468, pls. 6).—This is a report of investigations on potato diseases in continuation of those previously noted (*E. S. R.*, 27, p. 446), the diseases considered being essentially the same.

Spraying and other experiments for the control of the late blight of potatoes, due to *Phytophthora infestans*, are reported upon at some length. Spraying with Bordeaux and Burgundy mixtures gave rather conflicting results, a slight advantage, however, being in favor of the use of Bordeaux mixture. Investigations have shown that the best results were obtained when the plats were sprayed twice, beginning about the middle of June. The next best result was obtained by spraying 3 times, in which an earlier spraying was given to the plats. Comparisons were made of different strengths of Bordeaux and Burgundy mixtures, and where 1 per cent copper sulphate was used the results were practically as satisfactory as where a 2 per cent mixture was employed. Treating tubers with Bordeaux mixture before planting was without effect in controlling the disease. Notes are given on the resistance of different varieties, the presence of resting spores of the fungus, etc.

Further notes on the stalk or Sclerotium disease are given in which it appears that the infection of this disease is due directly to spores and not to vegetative mycelium in the soil. It had been previously noted, through accident, that the occurrence of this disease was correlated with the time of planting, and the investigations reported show that the number of plants attacked by the stalk disease diminishes with increased lateness of planting.

The heating of tubers for 4 hours at 50° C. was found not to affect injuriously the tubers used in planting, but had a reverse effect in reducing the amount of disease due to *Bacillus melanogenes*.

In experiments reported on the use of fungicides for disinfecting the soil in connection with the powdery scab, where flowers of sulphur was placed in the soil at the rate of 650 lbs. per acre, there was not only an increased yield of potatoes but a decided decrease in the percentage of diseased tubers harvested.

An account is given of the pink rot due to *P. erythroseptica*, a more technical account of which is given on page 550. This disease is believed to be contracted from the soil and appears to be most prevalent on land where potatoes are cultivated from season to season. There seems to be little evidence that it is communicated from tuber to tuber during storage, and for its prevention the selection of sound seed tubers and rotation of crops are recommended. Brief notes are given on the curl, leaf roll, and sprain of potatoes.

Potato tuber diseases, W. A. ORTON (*U. S. Dept. Agr., Farmers' Bul.* 544, pp. 16, figs. 16).—Popular descriptions are given of a number of the principal diseases of the potato, with suggestions for their control.

Potato diseases and methods of control, M. T. COOK (*New Jersey Stas. Circ.* 18, pp. 4).—Notes are given on a number of the more common diseases of the potato, with suggestions for their control.

Late blight and rot of potatoes, M. F. BARRUS (*New York Cornell Sta. Circ.* 19, pp. 77-83, figs. 7).—A description is given of the late blight or rot of pota-

toes due to *Phytophthora infestans*, with suggestions for control. The control measures recommended consist of thorough spraying with Bordeaux mixture.

Investigations of the potato fungus *Phytophthora infestans*, L. R. JONES, N. J. GIDDINGS, and B. F. LUTMAN (*Vermont Sta. Bul.* 168, pp. 100, pls. 10, figs. 10).—This is a reprint of Bureau of Plant Industry Bulletin 245 (E. S. R., 27, p. 544), the work having been carried on in cooperation between this Department and the Vermont Station.

The rotting of potato tubers by a new species of *Phytophthora* having a method of sexual reproduction hitherto undescribed, G. H. PETHYBRIDGE (*Sci. Proc. Roy. Dublin Soc., n. ser.*, 13 (1913), No. 35, pp. 529–565, pls. 3).—This paper deals with a new and characteristic type of tuber rot which occurs in Ireland and is caused by a new species of fungus to which the name *P. erythrospheptica* is given.

The rot begins when the tubers are still in the ground, but at what particular stage of growth the infection occurs has not yet been ascertained. It causes a rapid decay and produces wet rather than dry rot. The cut surfaces of affected tubers quickly turn pink when exposed to the air and later become almost black. The fungus has been isolated and grown in pure cultures, and inoculation experiments have been carried on which demonstrated that the disease was due to the organism in question. Studies were made of the characters of the fungus concerned with other species of the genus *Phytophthora*, and these led to the author's concluding that there should be a rearrangement of the species of this genus based on the sexual characters as described.

Leaf roll of potatoes, W. DIX (*Fühling's Landw. Ztg.*, 62 (1913), No. 6, pp. 214–222).—As the result of several series of experiments, it is stated that it is not possible to distinguish with any certainty normal plants from seed potatoes or young plants destined to produce crops showing the characteristic effects of leaf roll, nor is it possible at present to guard against this trouble.

The powdery scab of the potato in Maine, I. E. MELHUS (*Science, n. ser.*, 38 (1913), No. 969, p. 133).—The author calls attention to the discovery of the powdery scab of potatoes due to *Spongospora solani* in a lot of potatoes examined at Houlton, Me., in June, 1913. A considerable number of diseased specimens exhibited a mild form of the scab, which resembled the common scab due to *Oospora scabies*. Attention is called to this disease with the hope that pathologists will recognize it and assist in stamping it out as quickly as possible.

The history of beet rot (*Rhizoctonia violacea*), A. STIFT (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw.*, 42 (1913), No. 3, pp. 445–461).—This is a brief chronological summary of the studies published up to 1913 on the rot of sugar beets, concluding with some practical suggestions regarding its control.

The rôle of oxidases in curly top of sugar beets, H. H. BUNZEL (*Biochem. Ztschr.*, 50 (1913), No. 3–4, pp. 185–208).—The main results of this investigation have already been noted (E. S. R., 29, p. 48).

It is stated that the suppression of any normal function of a plant shows its effect in a heightened content of oxidases. The sap of all parts in such cases becomes more active, the seed leading in this respect and the leaves and roots following in turn. In the green parts of the plant a general correspondence seems to exist between the activity of the oxidases and the intensity of coloration.

Diseases and enemies of tobacco, L. PETERS and M. SCHWARTZ (*Mitt. K. Biol. Anst. Land u. Forstw.*, 1912, No. 13, pp. 128, figs. 92; abs. in *Ztschr. Landw. Versuchsw. Österr.*, 15 (1912), No. 12, p. 1309; *Bot. Centbl.*, 123 (1913), No. 3, pp. 65, 66).—The two parts of this article are dealt with separately by the authors. The first section discusses in considerable detail seed bed, wilt, and leaf diseases, phanerogamic parasites, and troubles of tobacco in the process

of curing, with proposed preventives or remedies; the other takes up animal pests of tobacco.

The fire blight disease and its control in nursery stock, V. B. STEWART (*New York Cornell Sta. Circ. 20*, pp. 85-94, figs. 4).—The author describes fire blight, which attacks many species of plants belonging to the section Pomace, and gives suggestions for the control of the disease in nursery stock.

In large nurseries it is recommended that the hold-over blight and sources of infection should be eradicated in the early spring before growth starts. Blossom buds, especially those on quince stock, should be removed. Frequent inspections of the diseased area should be made and all infections cut out and burned. Spreading of the disease in seedling blocks should be avoided as much as possible.

Treatment of fruit trees with lime-sulphur wash, E. MARRE (*Prog. Agr. et Vit. [Ed. l'Est-Centre]*, 34 (1913), No. 17, pp. 529-532).—It is claimed that a mixture of 3 kg. of powdered sulphur, 2 kg. of quicklime, and 100 liters of water, prepared according to directions given, is adherent and effective against rust of peaches and some other diseases of fruit trees.

Concerning court-noué, G. CHAPPAZ (*Prog. Agr. et Vit. [Ed. l'Est-Centre]*, 34 (1913), No. 18, pp. 554-557).—The author regards those cases of court-noué due to cold as accidental in a sense and self-remedial. He agrees with Trabut (E. S. R., 28, p. 650) that the persistent form observed in warmer climates is due to a form of gummosis.

On court-noué, L. RAVAZ (*Prog. Agr. et Vit. [Ed. l'Est-Centre]*, 34 (1913), No. 20, pp. 616-624).—This is a brief historical and descriptive report, made to the Society of Viticulturists of France, on court-noué under several names and in different forms and degrees exhibited in various geographical regions, including also its conditions of development, possible causes, and treatment.

The combat against grape mildew, A. CADORET (*Prog. Agr. et Vit. [Ed. l'Est-Centre]*, 34 (1913), No. 18, pp. 557-559).—The author claims that his observations, previously noted (E. S. R., 24, p. 50), have been confirmed in that the years of most serious outbreak of grape mildew prove to be those in which a cool spring is followed by a hot summer with much cloudy damp weather, the sycamores showing severe attack by *Glæosporium nervisequum* about 10 to 15 days previous to the attack of mildew on the vines. It is claimed that an early attack (in May) on the sycamores should be the signal for thorough spraying of the vines with Bordeaux mixture or copper acetate, preferably twice at intervals of about 15 days. For attacks in June, a combined treatment is recommended, consisting of the above sprayings, followed by a powder composed of bolted lime, sulphur, and copper sulphate in the proportions 60:30:10, respectively, or of lime, sulphur, and copper acetate in the proportions 60:33:7.

The presence of endocellular fibers in healthy vines and in those affected with roncet, EVA MAMELI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 22 (1913), I, No. 12, pp. 879-883).—The author claims, as the result of studies on 13 varieties of grapes, to have shown that the presence of the endocellular fibers, held by Petri (E. S. R., 28, p. 550; 29, p. 349) to be a constant feature of roncet, does not constitute an index of the presence of this disorder, these being found in various parts of normal vines, both native and foreign.

Scorching of grapes, L. RAVAZ (*Prog. Agr. et Vit. [Ed. l'Est-Centre]*, 34 (1913), No. 28, pp. 33-35, pl. 1).—A brief illustrated account is given of the detrimental effect of direct sunlight upon grapes, extending only to the fruit, stems, and leaves; also a discussion of contributing factors and possible remedies.

Silver thread disease of coffee in Surinam, J. KUIJPER (*Rec. Trav. Bot. Néerland.*, 9 (1912), No. 4, pp. 436-451, pl. 2).—The substances of this article has already been given (*E. S. R.*, 29, p. 351).

Study of a new species of *Peronospora*, F. VINCENS (*Bul. Trimest. Soc. Mycol. France*, 29 (1913), No. 1, pp. 174-180, pl. 1).—Results are given of a study of the fungus found on the upper leaf surface of *Cephalaria leucantha* in the botanical garden at Toulouse. The parasite is said to be new and has been named *P. cephalariæ* n. sp.

Further infection studies on *Ustilago antherarum*, E. WERTH (*Mitt. K. Biol. Anst. Land u. Forstw.*, 1912, No. 12, p. 18; *abs. in Mycol. Centbl.*, 1 (1912), No. 11, p. 369).—Continuing previous work (*E. S. R.*, 26, p. 552) with *Melandrium album*, the author claims that the presence of *U. antherarum* in the flowers of male plants promotes the development of a pistil. This remains rudimentary, it is true, but it exhibits a well differentiated ovarium.

Black spot of roses, F. A. WOLF (*Alabama Col. Sta. Bul.* 172, pp. 113-118, pls. 2, figs. 3).—The author presents in concise form the information at hand relating to the black spot of roses due to *Diplocarpon rosæ*, a previous description of which has been given (*E. S. R.*, 28, p. 449). The different stages of the fungus, which has been previously referred to as *Actinonema rosæ*, are described at length, and methods of control, which consist of proper sanitation, cultivation, and spraying with fungicides, are given. While different fungicides are successful in the control of this disease, the author recommends the use of ammoniacal copper carbonate, as it is less liable to discolor the plants.

Diseases of trees, K. BANCROFT (*Agr. Bul. Fed. Malay States*, 1 (1913), No. 6, pp. 218-221).—The cost of treatment of pink disease (*Corticium salmonicolor*) is reported to be \$1.05 per acre. Brown rot disease (*Hymenochaete noxia*) is supposed, from specimens sent for examination, to exist in Uganda, Africa, and to be more abundant in Ceylon than *Fomes semitostus*. The latter is thought to be spread by the heavy wash due to rains, etc. *Phyllosticta ramicola* is reported to be still spreading over the Federated Malay States, being closely followed by a *Diplodia*, causing die-back. The fungus observed on roots and stumps of Angsana trees has been identified as *Polystictus hirsutus* and not *P. occidentalis*, as at first thought, and is probably not parasitic.

Notes on tree pathology, L. SAVASTANO (*Ann. R. Staz. Sper. Agrum. e Frut. ticol. Acireale*, 1 (1912), pp. 111-140, pls. 8).—This article discusses certain common diseases of trees and their treatment, including kinds of instruments and their use, and includes brief reports on methods and results of treatments in cases described, with some of the conclusions drawn.

Chestnut bark disease, G. P. CLINTON (*Connecticut State Sta. Rpt.* 1912, pt. 5, pp. 359-453, pls. 8).—A detailed account is given of investigations carried on by the author on the identity of the fungus causing the chestnut bark disease, as well as its life history, present distribution, etc. A preliminary report on the identity of the fungus has been given elsewhere (*E. S. R.*, 28, p. 651).

The fungus is reported as occurring in 12 States, from New Hampshire and Vermont on the north to Virginia and West Virginia on the south. It consists of a conidial or *Cytospora* stage and also a mature or ascospore stage. In addition to occurring on the chestnut it has rarely been found on oaks, where as yet it has caused no serious damage. Artificial inoculation of chestnut sprouts or seedlings resulted in characteristic cankers in the bark, and these can be produced to some extent on oak sprouts.

The parasitic form of the fungus which results in the disease, according to the author, is so nearly like the species *Endothia gyrosa* that he has considered it as a variety, to which the name *E. gyrosa parasitica* is given.

Attention is called to the supposition that the fungus may have been introduced from Japan or from Europe, but the author maintains that it is a native species, which, because of peculiar conditions detrimental to the host, has assumed unusual virulence and widespread prominence. The unfavorable conditions are believed to be the unusual severity of the winter of 1903-4, followed by a series of years in which summer droughts were exceptionally severe.

A bibliography of the subject is given.

Cultural characters of the chestnut blight fungus and its near relatives, C. L. SHEAR and N. E. STEVENS (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 131, pp. 3-18*).—The results of a study carried on to determine methods of separating the different species of fungi associated with the chestnut blight are given. The chestnut blight fungus *Endothia parasitica* is said to have three rather close relatives, *E. radicalis*, *E. radicalis mississippiensis*, and *E. gyrosa*. In their pycnidial condition these species are said to be difficult to distinguish either by macroscopic or microscopic examination.

Studies of more than 2,000 pure cultures of these fungi, to test their relation to light, moisture, and temperature, and their behavior on different culture media, have been made. It was found that they possess constant and easily recognized cultural characters on several culture media, of which potato agar and corn meal are the best that have been tried.

The resistance of the Japanese chestnut to black root rot, R. FARNETI, E. G. LISSONE, and L. MONTEMARTINI (*Riv. Patol. Veg., 6 (1913), No. 1, pp. 1-7*).—From this study the conclusion is reached that while the Japanese chestnut does not enjoy absolute immunity as regards black root rot in Italy, it does possess a considerable degree of resistance thereto at present. The possible bearings of this are discussed.

Oïdium of oak, L. A. HAUCH and F. K. RAVN (*Forstl. Forsøgsv. Danmark, 4 (1913), No. 2, pp. 57-115, figs. 5*).—This is a report on the appearance, progress, and effects of Oïdium in the oak forests of Denmark.

Reported first in 1904, it was found in all parts of the country by 1908 and it continues to increase in importance. The attack is said to present much the same aspects as in central Europe, the second year's growth showing the effects in marked degree. The leaves are lost in an early stage of development. Both *Quercus pedunculata* and *Q. sessiliflora* are severely attacked, *Q. rubra* and *Q. palustris* very slightly if at all. In some localities *Fagus sylvatica* was attacked by the same fungus. No perithecia were found, but the authors favor the view that the fungus passes the winter in the oak buds. A small percentage of the oaks appear to enjoy immunity, due to some cause at present unknown. Those attacked showed inferior growth, bud formation, and lignification along with alterations in structure and nutrition. It is said that the attack does not prevent absorption of nutritive material from the soil, but that it does prematurely arrest the assimilation of carbon dioxide in the leaves; the lack of nonnitrogenous organic materials accounting in large part for the pathological changes observed, which seem to be closely associated with insufficient regulative power during the second period of growth, during which starch production is quite low. The power of resistance to cold is lessened and winter killing of branches or their tips is common. Growth is checked, a diseased oak of 8 or 10 years showing about the same height as a normal growth of 5 or 6 years.

It is stated that spraying with potassium polysulphid solutions checks the propagation of oak Oïdium, but that this treatment is probably too laborious and expensive to be successfully applied to forest trees. The work concludes with a bibliography.

The present status of the white-pine blister rust, P. SPAULDING (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 129, pp. 9-20, figs. 6*).—The author presents new information concerning the blister rust of white pine and the fungus causing it, supplementing a previous report (*E. S. R., 25, p. 457*). The information includes additional field characters by which the disease may be recognized. Notes on the origin of diseased stock, on the inefficiency of inspection even when repeated, variations in the fruiting of the fungus, distance to which its spores are distributed, and methods by which the fungus is carried from one place to another, together with abstract of recent legislation regarding this disease, are included.

A new disease on the larch in Scotland, A. W. BORTHWICK and M. WILSON (*Notes Roy. Bot. Gard. Edinb., 8 (1913), No. 36, pp. 79-82, pl. 1; noted in Gard. Chron., 3. ser., 53 (1913), No. 1378, p. 348*).—A disease of larch due to *Peridermium laricis* is described, this fungus not having been hitherto reported in Scotland. It is said to attack larch early in the season and is found fully developed on leaves only three weeks old. Its presence resulted in the shedding of the leaves as early as June 30. The fungus is always found on the upper side of the leaves and sometimes also on the lower side. It is distinguished from *Cæoma laricis*, which produces orange-colored spots on the leaves, by its pseudoperidium.

Merulius sclerotiorum, M. MÖBIUS (*Ber. Deut. Bot. Gesell., 31 (1913), No. 3, pp. 147-150, pl. 1*).—The author describes in some detail the fungus found on structural timber of houses and supposed by him to belong to *Merulius sclerotiorum* already described by R. Falck (*E. S. R., 28, p. 751*).

Spraying mixtures, G. CHAPPAZ (*Prog. Agr. et Vit. [Ed. l'Est-Centre], 34 (1913), No. 16, pp. 487-491*).—Continuing previous work (*E. S. R., 27, p. 254*), the author gives additional formulas and directions for the preparation and use of fungicides.

Adherent spraying mixtures, H. ASTRUC (*Prog. Agr. et Vit. [Ed. l'Est-Centre], 34 (1913), Nos. 24, pp. 746-753; 25, pp. 780-782*).—This is a discussion of the observed effects of several components, in varied proportions, of spraying mixtures, with some recommendations as to the proportions considered safe and effective.

Action of silver on *Aspergillus niger*, H. CLÉMENT (*Compt. Rend. Soc. Biol. [Paris], 74 (1913), No. 13, pp. 749, 750*).—It is here claimed as the result of long experimentation that silver salts are not necessarily and in all concentrations incompatible with the development of *A. niger*.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The birds of Virginia, H. H. BAILEY (*Lynchburg, Va., 1913, pp. XXIII+362, pls. 15, figs. 108*).—This work deals with those birds which are known to breed within the limits of the State and is based upon studies commenced in 1889. A hypothetical list is given of such birds as should breed within the State, but of which the author has been unable to gain satisfactory evidence of their doing so.

The halftones are from photographs taken from nature by the author and his ornithological friends.

Proposed regulations for the protection of migratory birds (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 92, pp. 6*).—These regulations have been prepared, pursuant to the provisions of the act of March 4, 1913 (*E. S. R., 28, p. 302*), to become effective on or after October 1, 1913. The text of the provisions is appended.

Explanation of the proposed regulations for the protection of migratory birds, T. S. PALMER (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 93, pp. 5*).—This is a discussion of the regulations drawn up for the protection of migratory birds under the federal law, as above noted.

Two new species of parasitic nematodes, B. H. RANSOM (*Proc. U. S. Nat. Mus., 41 (1912), pp. 363-369, figs. 7*).—The species here described as new are *Trichostrongylus falculatus*, a parasite in the the alimentary tract of the goat (*Capra hircus*) in South Africa; and *T. calcaratus* from the small intestines of the rabbit (*Lepus sylvaticus*) at Bowie, Md.

A new nematode, *Ostertagia bullosa*, parasitic in the alimentary tract of sheep, B. H. RANSOM and M. C. HALL (*Proc. U. S. Nat. Mus., 42 (1912), pp. 175-179, figs. 4*).—This new nematode has been collected from sheep at Colorado Springs, Resolis, and Amo, Colo., and in Montana. The greatest number found in a single sheep in Colorado was 73.

Entomology with special reference to its biological and economic aspects, J. W. FOLSOM (*Philadelphia, 1913, 2. rev. ed., pp. VII+402, figs. 321*).—This is a second revised edition (*E. S. R., 17, p. 1088*).

Injurious insects and other animals observed in Ireland during the year 1912, G. H. CARPENTER (*Econ. Proc. Roy. Dublin Soc., 2 (1913), No. 6, pp. 79-104, pls. 2, figs. 9*).—This is the author's annual report on the occurrence of insect pests during the year.

The enemies of barley, P. NOEL (*Bul. Lab. Régional Ent. Agr. [Rouen], 1912, No. 4, pp. 5-7*).—Some 26 species attacking barley are listed.

The asparagus miner and the twelve-spotted asparagus beetle, D. E. FINK (*New York Cornell Sta. Bul. 331, pp. 411-435, pls. 7*).—The asparagus miner (*Agromyza simplex*) first considered (pp. 411-421) may at times injure seedlings and newly set asparagus beds to such an extent as to lead growers to consider plowing them under. The history and distribution of this native American species, first considered, is followed by discussions of the indication of its presence, nature, and extent of injury, descriptions of its stages, life history and habits, and methods of control.

The mines begin at or near the surface of the soil and extend upward for a foot or more, assuming a zigzag appearance as the larvæ wind their way upward. When several larvæ are working on one stalk, as is usually the case, the mines soon begin to merge and the entire base of the stalk becomes girdled. As soon as the adults appear in spring they begin to lay eggs on volunteer plants or seedling beds, but make no attempt to oviposit on cutting beds.

In observations made in 1912 in the vicinity of Ithaca, N. Y., the adults began to issue forth on May 26. Mating began on the second day following and oviposition followed within 24 to 36 hours. The female usually begins to oviposit at the base of the stalk, at or near the surface of the soil. The eggs hatch in from 12 to 18 days, and the larvæ mine their way up the stalk. "When nearly full grown the larvæ direct their mines downward, and later continue to mine below the surface of the soil, so that when they finally become full grown they can pupate below the surface of the soil where they are kept moist. During the summer, however, the larvæ may pupate anywhere along the stalks, above or below the surface of the soil. The depth varies at which they pupate below the surface of the soil." The larvæ of the first generation attain full growth by the end of June to the first week in July and pupate beneath the epidermis of the stalks, in which stage 17 to 21 days are passed. The adults soon begin to oviposit and the life cycle is repeated. The larvæ of the second generation attain their full growth by the end of August to the first week in September.

The puparia formed remain over winter, the adults not appearing before May of the following year.

Experiments were conducted by the author during the summer of 1912 with sprays for killing both the larvæ and the flies. Only negative results were obtained in experiments in which blackleaf 40 tobacco extract was used at the strength of 1:700, with 4 lbs. of soap added as a sticker. In experiments in which blackleaf 40 was used at the rate of 1:500 with 4 lbs. of soap added as a sticker, young larvæ just beginning their mines were killed, and full-grown or nearly full-grown larvæ either went into pupation soon after the spraying or emerged from the mines to the surface of the stalks. Cage control experiments carried on with a view to destroying the adults, in which potassium arsenate was used at the rate of 1 part to 45 of water to which sirup was added, resulted in the death of the flies in 12 to 24 hours, but injury to the plants resulted. In the second experiment in which arsenate of lead, 2 lbs. to 50 gal. of water, was used, with 12 lbs. of sirup added, all the flies were found dead within 36 to 48 hours.

The author is of the opinion that when both the miner and the beetles are present the use of arsenate of lead in the proportions mentioned with the sirup added will control both pests, and that by pulling the infested stalks in late fall or early spring, and by the use of the spray for the flies and beetles, the miner can easily be exterminated. An annotated bibliography is included.

An account of the twelve-spotted asparagus beetle (*Crioceris duodecimpunctata*) (pp. 422-435) follows. This beetle, first observed in 1881 in the vicinity of Baltimore, Md., has since spread northward through the North Atlantic and New England States and into Canada. Injury is caused by the beetles, which feed first on the stalks and branches, gnawing the epidermis and biting out large pieces, and later, to a large extent, on the blossoms and berries. The larvæ almost immediately after they are hatched seek out and enter the berries, leaving one berry for another until they have become matured.

Technical descriptions of its stages and an account of the life history and habits follow. "The beetles emerge about the middle of May, usually about a week later than the common species. Egg laying does not begin until 3 to 4 weeks after the emergence of the beetles, or about the middle of June in the vicinity of Ithaca. Within 7 to 12 days the eggs hatch and the larvæ immediately enter the berries. A week to 10 days is spent within the berries before the larvæ become mature, when they enter the soil. Pupation lasts 12 to 20 days before the adults appear. In the vicinity of Ithaca the adults of the first generation begin to emerge about July 20. Egg laying for the second brood commences about August 1 and the larvæ hatch about August 9. . . . As the beetles do not begin to deposit their eggs until 3 to 4 weeks after their emergence in spring, spraying with arsenate of lead—2 lbs. to 50 gal. of water, with 2 to 4 lbs. of soap added as a sticker or 12 lbs. of sirup added when the asparagus miner is present—will effectively destroy the beetles before they have had a chance to deposit their eggs."

An annotated bibliography of 6 pages is appended.

The enemies of the radish, P. NOEL (*Bul. Lab. Régional Ent. Agr. [Rouen], 1913, No. 3, pp. 15, 16*).—The author lists 18 enemies of radishes occurring in France.

The enemies of spinach, P. NOEL (*Bul. Lab. Régional Ent. Agr. [Rouen], 1913, No. 1, pp. 13, 14*).—This is a list of the insects attacking spinach in France.

Control of two elm-tree pests, G. W. HEBRICK (*New York Cornell Sta. Bul. 333, pp. 491-512, figs. 18*).—The first part of this bulletin deals with the elm leaf beetle (*Galerucella luteola*), spraying for the control of which has been

carried on at Ithaca through 2 seasons. The spraying apparatus, spraying operations, details of cost of spraying elms on Cornell University campus, cost of spraying shade trees in other localities, proper time for spraying, amount of poison to use and number of times to spray, and the life history and habits of the elm leaf beetle are considered.

A brief account of the elm leaf miner (*Kaliosysphinga ulmi*), its life history and control measures follows (pp. 508-511). Spraying experiments carried on at Ithaca have shown blackleaf 40 tobacco extract used at the rate of 1 pint to 100 gal. of water with 5 lbs. of soap to be very effective and more so than is blackleaf. The trees must be sprayed as soon as the miner begins to show in the leaves. It is pointed out that one great advantage gained in the use of tobacco extracts is that arsenate of lead may be added for the leaf beetle, thus obviating the necessity of a separate spray for each insect.

The importance of supplanting elms and maples as shade trees by those less subject to insect attack, such as oaks, especially the pin oak and red oak, and by the ginkgo tree and others is emphasized.

The mole cricket (*Scapteriscus didactylus*), E. L. WORSHAM and W. V. REED (*Georgia Sta. Bul. 101, pp. 249-263, pl. 1, figs. 2*).—The mole cricket is said to have become in recent years the source of great alarm to farmers in the coastal counties of Georgia. The present bulletin on the pest is based upon investigations carried on during the years 1910 to 1912, inclusive, and deals with its history, territory at present infested, description of the adult, life history and habits, means of spread, influence of soil on the crickets, list of plants attacked, remedies, etc.

Truck crops as a rule are the most seriously injured, lettuce, peppers, tomatoes, turnips, and potatoes, including both the vine and tubers, being eaten. Pastures and lawns suffer severely from the cricket and particularly those sodded in Bermuda grass, large areas having frequently been completely killed by the cricket. Of the staple crops attacked sugar cane is said to rank first.

Studies of the life history show mating to take place in the early spring, and that there is but a single brood during the year. The eggs, which number from 20 to 60, are deposited from April 15 to June 15 in earthen cells, usually within 5 in. of the surface, and hatch in from 24 to 26 days. The young crickets, which remain in the chamber for the first few days, gradually become more active, burrow through the loose earth leading to the main tunnel, and gain access to the surface. They then burrow and feed for several weeks before scattering to any distance, from 8 to 12 months elapsing, during which time 8 molts are passed, before the young crickets reach the adult stage.

It is stated that the crickets feed altogether at night, at least above the surface. From their tunnels they may fly from place to place until they find an area in which suitable food is found, when they literally pulverize the soil by burrowing beneath the surface. If growing plants, as young tomatoes, are within their reach they frequently destroy a large percentage of the plants in a single night by gnawing them down just at the surface of the ground. It is stated that the crickets can fly great distances, having been observed upon leaving the ground to soar above the tree tops before being lost to view. While plant life, particularly young and tender roots, constitutes by far the larger percentage of the mole cricket's food, animal life may also make up its diet. It is said to be a well-known fact that the cricket is confined to sandy loam or peaty soils.

A single parasite is known to attack the cricket, this being a species of fly which attacks the females after oviposition. Protecting plants and plowing breeding areas 2 or 3 times between April 15 and June 15 are the chief artificial

preventives. Trapping in compost heaps especially in winter and by lanterns in the spring is said to give good results.

"Poisoned baits made of cotton-seed meal in which arsenate of lead or Paris green has been incorporated furnish the most tempting baits for the mole crickets. The baits can be scattered broadcast on the surface or covered if animals that would likely eat the poison are allowed to run at large. Sulphur distributed in the seed drill along with the seed acts as a repellent to a certain extent. Naphthalin flakes placed near plants serve to repel the mole cricket, but its injury to vegetation precludes its general use. Banding individual plants by means of tin, paper, or wire cylinders will afford protection and is recommended for tomatoes and plants of like nature."

Thrips tabaci and its ravages in Hungary, E. TÖRÖK (*Magyar Dohánynevelés*, 30 (1913), No. 1, pp. 6-9; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 3, pp. 493, 494).—This thrips, observed for the first time in Hungary in 1890, has since spread with increasing rapidity. In 1908 the author recorded the occurrence of this pest in 7 districts of the country, 2 of which, Arad and Temes, had suffered considerably. While the invasion in 1909 was less severe, due to the season being unfavorable to its propagation, it now threatens to extend even to the eastern portion of Hungary.

Cicadas as pests, W. W. FROGGATT (*Agr. Gaz. N. S. Wales*, 24 (1913), No. 4, pp. 341-344, figs. 3).—This is a discussion of the occurrence of, and injury by, *Melampsalta incepta* in Australia.

The woolly aphid, C. W. WOODWORTH (*California Sta. Circ.* 102, pp. 4, fig. 1).—A brief popular account.

The oyster-shell scale (*Lepidosaphes ulmi*), F. SHERMAN, Jr. (*Bul. N. C. Dept. Agr.*, 34 (1913), No. 6, pp. 23, figs. 6).—A somewhat detailed account of this pest with remedial measures therefor.

The tent caterpillars, J. M. SWAINE (*Canada Expt. Farms, Div. Ent. Circ.* 1, 1913, pp. 14, figs. 8).—This circular deals with *Malacosoma americana* and *M. disstria*.

The brown-tail moth, A. VUILLET (*Rev. Phytopath. Appl.*, 1 (1913), No. 2, pp. 17-19, figs. 4; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, pt. 8, pp. 270, 271).—This is a discussion of the occurrence of the brown-tail moth in France. The author states that there are 17 known dipterous and hymenopterous parasites of this pest in Europe.

The oak tortrix in Italy (*Tortrix viridana*), G. CECCONI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, 6 (1912), pp. 308-319, figs. 6; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 2, p. 327).—The larvæ of this tortricid moth caused serious injury in 1911 and again in 1912. The present paper gives a description of the species, biological notes, etc.

Codling moth control in the Sacramento Valley, C. W. WOODWORTH (*California Sta. Circ.* 101, pp. 4, figs. 3).—A brief popular account.

Rabdophaga saliciperda damaging willows in Italy, G. CECCONI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, 6 (1912), pp. 320-330, pl. 1, figs. 3; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 2, p. 328).—The willow wood midge (*R. saliciperda*), recorded from France, Austria, and Germany in 1841, was first recorded from Italy by the author in 1910 on *Salix alba*. Outside of Italy this midge attacks other species of willows and also *Populus alba*. The larvæ tunnel into the wood of the young trunks and branches.

Several parasites of this pest have been reared by the author. Remedial measures consist in covering the infected parts of the tree with a viscous sub-

stance in order to prevent the exit of the pupæ and adult insects, or cutting off and burning all such parts.

Progress in the control of the salt marsh mosquito, T. J. HEADLEE (*New Jersey Stas. Circ.* 17, pp. 3-10, figs. 3).—This is a brief account of the progress which has been made in control work in New Jersey.

Ditching work has been going on continuously since 1906 until all the salt marsh from Secaucus to a point a few miles below Barnegat has been drained. This drainage has relieved the whole shore line from Secaucus to Sandy Hook, and has demonstrated beyond doubt that the drainage of the salt marsh relieves adjacent cities and villages from the salt marsh mosquito plague. In addition to an estimated increased valuation of the shore property to an extent of 15 per cent, the drainage of the salt marsh increases the yield of salt marsh hay. "It seems therefore very conservative to say that the completion of the control of the salt marsh mosquito will bring about an increase in value of not less than \$26,000,000. Careful estimates indicate that the total cost of completing the ditching, in view of the increased cost of that operation, will probably be not less than \$300,000."

How does the house fly pass the winter? II. SKINNER (*Ent. News*, 24 (1913), No. 7, pp. 303, 304).—The author concludes that the house fly hibernates in the pupal stage and in no other way.

The stable fly, F. C. BISHOPP (*U. S. Dept. Agr., Farmers' Bul.* 540, pp. 28, figs. 10).—This is a summarized account of information relating to *Stomoxys calcitrans*, including its distribution and abundance, the severe outbreak of the stable fly in 1912, hosts, character of injury and losses, action of animals attacked, summary of life history, development and habits, seasonal history, agricultural practices in relation to fly abundance, and natural and artificial control.

A report of studies of this pest by the author has been previously noted (*E. S. R.*, 29, p. 256).

Attempts to transmit poliomyelitis by means of the stable fly (Stomoxys calcitrans), W. A. SAWYER and W. B. HERMS (*Jour. Amer. Med. Assoc.*, 61 (1913), No. 7, pp. 461-466, fig. 1).—In a series of 7 experiments conducted under the auspices of the California State Board of Health and the California Experiment Station in which the conditions were varied, the authors were unable to transmit infantile paralysis from monkey to monkey through the agency of the stable fly.

In their studies of the stable fly at Berkeley, Cal., the fly larvæ were found in abundance during the fall and first half of the winter in moist decaying alfalfa and grain hay, in the bottoms of outdoor feeding troughs for cattle, in wet middlings which had accumulated beside a mixing trough in a dairy, in a pile of decaying onions, and in a wet mixture of decaying weeds and grass. Larvæ and pupæ were plentiful also in wet hay siftings under a large dairy barn and at the bottom of a stack of hay piled in an inadequately drained horse barn. It is pointed out that since *Stomoxys* larvæ and pupæ are rarely found in manure, a favorite breeding place for the house fly, the measures successful in the control of the house fly are not adapted for the suppression of the stable fly.

"In the study of the life history of the stable fly (*S. calcitrans*), we observed that in the insectary at from 23 to 26° C. (from 73.4 to 78.8° F.) female flies deposited eggs on the eighteenth day after their emergence from the pupa cases. The number of eggs deposited varied from 25 to 124, but it was most frequently between 30 and 35. Usually the flies died a few days after ovulation. A set of flies which were fed only on sugar water deposited no eggs,

although many of them lived 20 days or longer, while control flies fed on blood did lay eggs.

"The incubation period in eggs kept at from 16 to 25° C. (from 60.8 to 77° F.) varied from 2 to 5 days and was commonly 3 days. The newly hatched larvæ buried themselves in the breeding material, being strongly negatively heliotropic. The larvæ required much moisture. They grew slowly, compared to house fly and flesh fly larvæ, reaching full growth in from 14 to 26 days (usually about 18), depending on moisture, light, and temperature. Before pupation the larvæ crawled up into the drier layers of the decaying vegetable matter in which they developed and became pupæ in less than 1 hour after they had begun to change. We found the pupal period at from 23 to 26° C. to vary from 6 to 26 days, but usually to lie between 9 and 13 days.

"The total time at 21° C. from the laying of the egg to the hatching of the adult fly was from 33 to 36 days, as observed in 5 individuals.

"The length of life of the flies under the favorable conditions of feeding in our principal experiments was on the average 20 days. The maximum was 69 days, and was observed in a female fly."

Poliomyelitis.—Further attempts to transmit the disease through the agency of the stable fly (*Stomoxys calcitrans*), J. F. ANDERSON and W. H. FROST (*Pub. Health Rpts.* [U. S.], 28 (1913), No. 18, pp. 833-837).—The authors, having carried out several series of more extended experiments than those previously noted (E. S. R., 28, p. 161), report that the results of all later experiments, contrary to their expectations, have been entirely negative. Up to the time of writing they had found no satisfactory explanation for this discrepancy.

A study of the biology of the apple maggot (*Rhagoletis pomonella*), together with an investigation of methods of control, J. F. ILLINGWORTH (*New York Cornell Sta. Bul.* 324, pp. 129-187, pls. 13).—This bulletin is based upon studies commenced in 1910 and carried on through the entire seasons of 1911 and 1912. The subject is dealt with under the headings of methods of work, history of the apple maggot, seriousness of the pest, other fruit flies, life history and habits, technical description, methods of control, etc.

The principally infested districts extend from New Brunswick, Quebec, and Ontario, south to Pennsylvania, with a single record from North Carolina, westward to Iowa and Wisconsin, with brief mention in Minnesota, South Dakota, and Colorado. Under host plants the author includes a revised list of apple varieties, showing their relative infestation. The author has found no variety that is known to be immune, although the hard winter sorts soften so little before cold weather comes on that probably most of the larvæ fail to develop. Haws and wild crabapples appear to have been the original foods. Subsequent records show cultivated fruits to be attacked, principally apples, although pears, cultivated crabapples, and huckleberries are also included.

In the vicinity of Ithaca the first-brood flies appear to emerge from the middle of June up to August 1, and there are second-brood flies which begin emerging soon after the latter date, so there is an almost continuous new supply of flies from June up to the time of heavy frosts. Twenty Bough apples examined showed from 11 to 36 egg punctures each. Flies reared in cages mated from the eighth to tenth day after emerging and oviposited on the twenty-fourth day. The eggs were found to hatch in from 2 to 6 days. "The growth of the larva varies greatly. Under the most favorable conditions, a ripening fruit and warm weather, the larva may be fully developed and emerge within two weeks from the time that the egg hatches; while if the fruit is very hard and green or the weather cold, growth slows down and the time of emergence is put off for months. . . . In only one case has the writer found that the larvæ leave the fruit while it is

hanging on the tree. . . . The larvæ normally go into the soil to pupate if they are where they can do so, and pass the winter in this dormant state. . . . The depth to which the larvæ enter the soil depends largely on its character; in heavy clay the puparia are usually found directly beneath the fruit, while in sandy soil they are frequently found at a depth of 2 in." Puparia are, however, often found within decayed fruit. The pupal period may last for only about a month for the early emerging larvæ, but it continues over the winter in late varieties. In the author's experiments about 30 per cent of the larvæ which entered the soil emerged as second brood flies.

In order to determine the length of the life of the flies, those of the first brood ovipositing in the orchard were collected and confined in inverted jelly glasses. The males lived about 5 weeks and the females 6 weeks after being confined. The flies of the second brood began dying after a confinement of 30 days in October, the last which died on November 6 having lived 50 days.

The methods of control considered include picking up windfalls; burying puparia; the use of citronella oil, kerosene, and quassia; cold storage; cultivation; pupation without soil; poisoned bait; and codling moth spray. "Several experiments have shown that the flies are able to emerge when buried deeply in the soil, hence plowing in the fall or spring can not be counted on for a remedy, and covering the infested fruit in pits is not recommended. . . . Sweetened arsenate of lead proved effective, but was rather slow, so that in the writer's early experiments soluble potassium arsenate was tried. This killed the flies in 30 minutes. Subsequent observations indicate that the arsenate of lead alone may control this pest if applied thoroughly to the fruit, as is done for the codling moth." Experiments during the season of 1912 showed good results to be obtained from the use of a mixture consisting of molasses 1 lb., arsenate of lead 3 oz., and water 4 gal., when applied as the flies first emerge, repeated every 10 days while the flies are in the field, and renewed after each rain.

An annotated bibliography of 16 pages is appended.

The simultaneous destruction of *Colaspidea atrum* and lucern dodder by calcium cyanamid, L. E. SOLANET (*Destruction Simultane du Négril e de la Cuscute des Luzernes. Montpellier [1913], pp. 30; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 4, p. 663*).—The author reports that calcium cyanamid, reduced to as fine and light a powder as possible and applied annually at the rate of 90 lbs. per acre, has thus far proved to be the most effective remedy employed in combating both this chrysomelid beetle and the parasitic plant, while at the same time it interferes in no wise with the growth of the alfalfa. Since the cyanamid is difficult to spread uniformly, the author recommends mixing it with an equal bulk of wood ashes and twice its bulk of gypsum.

Common white grubs, J. J. DAVIS (*U. S. Dept. Agr., Farmers' Bul. 543, pp. 20, figs. 12*).—This is a general account of the larvæ of the May beetles (*Lachnosterna* spp.), commonly known as white grubs, including their injury, life history, and habits, grubs likely to be mistaken therefor, natural enemies, and methods of control.

Probably the most serious outbreak of white grubs in the history of American agriculture occurred in 1912, following an abundance of beetles in 1911, their injury having been reported from almost every section of the country north of the Ohio River and westward to South Dakota. In the worst infested districts it was not unusual to find from 40 to 60 grubs in a single hill of corn. It is estimated that the damage to corn, timothy, and potatoes in the States of Iowa, Wisconsin, and Illinois in 1912 amounted to not less than \$7,000,000 and in other infested areas to not less than \$5,000,000.

Since the life cycle of the more abundant and injurious species in these localities appears to be 3 years, it is pointed out that an outbreak may be looked for in 1915. Methods of control are discussed under the headings: Utilizing hogs and poultry for destroying the grubs, fall plowing, rotation of crops, collecting the grubs and beetles, and spraying.

Injury by the cleoninid weevils *Conorhynchus luigionii* and *Lixus junci* to sugar beets in Campania, Italy, R. ROSSI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, 6 (1912), pp. 26-42, pl. 1; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 2, p. 325).—*C. luigionii* in the adult stage feeds upon the leaves of even the youngest plants and in the larval form destroys the pulp of the root. The injury by *L. junci* is caused by gnawing holes in the stalks of the plants in which the eggs are deposited. Nearly all beets thus attacked are said to die, due to being cut in two. The larvæ which hatch from the eggs laid along the veins of the leaves when the plants are well developed excavate long galleries in the roots.

Remedial measures consist in the killing by hand of the adults which hide under stones, in crevices of the soil, and under leaves, supplemented by the use of arsenicals.

Parasites of the apple weevil (*Anthonomus pomorum*) in the Val di Non, Austria, G. CATONI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, 6 (1912), pp. 148-150, figs. 2; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 2, p. 322).—Of 3,000 larvæ taken from as many apple blooms in April, 1911, 846 or 28.2 per cent are said to have been parasitized, as follows: 647 by *Pimpla pomorum*, 63 by *Meteorus ictericus*, 29 by *Habrocytus fasciatus*, and 6 by *Apanteles impurus*, with a noticeable preponderance of females. Sixty-three larvæ had shriveled up and the remaining 38 had been destroyed by the fungus *Verticillium puparum*.

Systematic notes and descriptions of some weevils of economic or biological importance, W. D. PIERCE (*Proc. U. S. Nat. Mus.*, 42 (1912), pp. 155-170).—This paper deals with the more important cotton weevils, namely, the Mexican cotton boll weevil (*Anthonomus grandis*), the Peruvian cotton square-weevil (*A. vestitus*), and the Philippine cotton flower weevil (*Ecthetopyga gossypii* n. g. and n. sp.).

The cactus weevils, of which 25 are noted, include 8 new species. Three miscellaneous new species of biological interest are noted.

Descriptions of new Hymenoptera, III, J. C. CRAWFORD (*Proc. U. S. Nat. Mus.*, 41 (1912), pp. 267-282, figs. 6).—Among the 21 species here described as new are *Scelio pulchellus*, reared from the eggs of the small plague locust (*Chortoicetes pusilla*) in New South Wales; *S. froggatti*, reared from the eggs of the plague locust (*C. terminifera*) in Queensland; *S. fulgidus*, a parasite of the eggs of *Bachytilus australis*; *Chalcis compsilurae*, reared from the puparia of the tachinid *Compsilura cinnnata* in Massachusetts, and also occurring in Wisconsin; and *Eurytoma pyrrhocerus*, said to have been reared from the codling moth in New South Wales.

Descriptions of new Hymenoptera, IV, J. C. CRAWFORD (*Proc. U. S. Nat. Mus.*, 42 (1912), pp. 1-10, figs. 2).—The species here described as new are largely reared exotic parasites.

Descriptions of one new genus and three new species of ichneumon flies, H. L. VIERECK (*Proc. U. S. Nat. Mus.*, 41 (1912), pp. 293-295).—The species here described as new are *Celoides brunneri*, reared from *Dendroctonus pseudosugae* at Columbia Falls, Mont.; *Megarhogas theretrae*, reared from the larvæ of the moth *Theretra celerio* in Sumatra; and *Zaleptopygus oberew* n. g. and n. sp., from Chicago, Ill., a parasite of *Oberea tripunctata*.

Descriptions of five new genera and twenty-six new species of ichneumon flies, H. L. VIERECK (*Proc. U. S. Nat. Mus.*, 42 (1912), pp. 139-153).—Among the species of economic importance are *Apanteles fumiferanæ*, a parasite of the spruce budworm (*Tortrix fumiferana*) from Quebec, Canada; *A. tischeriæ*, a parasite of *Tischeria malifoliella*, at Woodside, Del.; *Microbracon hyslopi*, reared from *Etiella zinckenella* at Pullman, Wash.; *A. electraæ*, reared from *Hemileuca electra*, at San Diego, Cal.; *A. sesiaæ*, a parasite of *Sesia scitula*, at Vienna, Va.; *Acnoplegimorpha phyttonomi*, reared from the alfalfa weevil at Hoytsville, Utah; *Monoblastus caliroæ*, a parasite of the pear slug at Vienna, Va.; etc.

Contributions to our knowledge of bees and ichneumon flies, including the descriptions of twenty-one new genera and fifty-seven new species of ichneumon flies, H. L. VIERECK (*Proc. U. S. Nat. Mus.*, 42 (1912), pp. 613-648, figs. 2).—The species of economic importance include *Apanteles aristoteliæ*, reared from *Aristotelia fungivorella*, *A. choreuti*, reared from *Choreutis cardinella*, and *A. epinotiæ*, reared from *Epinotia saliciana*, all at Anglesea, N. J.; *A. gelechiæ*, reared from *Gelechia trialbamacutella*, at East River, Conn.; *A. plesius*, reared from a larva on white oak, Essex County, New Jersey; *A. polychrosidis*, reared from *Polychrosis liriodendrana*, Washington, D. C.; *A. trachynotus*, reared from *Pegomyia vicina*, Little Silver, N. J.; *Cantharoctonus stramineus*, *Microbracon vestitica*, and *Triaspis vestitica*, all reared from the Peruvian cotton square-weevil (*Anthonomus vestitus*) in Peru; *Macrocentrus cerasivoranæ*, reared from *Archips cerasivorana*, at Ithaca, N. Y.; *Campoplex hellulæ*, reared from *Hellula undalis*, at Santa Ana, Cal.; *Campoplex caradrinæ*, reared from *Caradrina exigua*, at Rocky Ford, Colo.; *Sagaritis websteri*, a parasite of *Gelechia gallaeolidaginis* in Louisiana; *Xylophruridea agrili*, reared from *Agrilus vittaticollis*, at French Creek, W. Va.; etc.

Conostigmus rodhaini n. sp., a proctotrypid endoparasite of the pupæ of *Glossina palpalis*, J. BEQUAERT (*Rev. Zool. Afric. [Brussels]*, 2 (1913), No. 2, pp. 253-258, pl. 1).—A comparatively rare parasite of the tsetse fly in Uganda.

The Argentine ant, W. NEWELL and T. C. BARBER (*U. S. Dept. Agr., Bur. Ent. Bul.* 122, pp. 98, pls. 13, figs. 13).—This account of *Iridomyrmex humilis* presents the principal results of 5 years of almost constant observations and experiment by the senior author at Baton Rouge, La., and in the orange-growing section of the same State, together with observations made by the junior author in New Orleans in connection with investigations of sugar cane insects.

The subject is taken up under the headings of history and distribution, means of dispersion, economic importance, systematic position, methods of study, life history, the colony as a whole, relations with other Arthropoda, natural control, and methods of repression. A bibliography is appended.

Much of the data here presented have previously been noted from other sources (*E. S. R.*, 21, p. 350; 22, p. 656).

New sawflies in the collections of the United States National Museum, S. A. ROHWER (*Proc. U. S. Nat. Mus.*, 41 (1912), pp. 377-411, figs. 14).—Several of the 63 forms here described as new appear to be of some economic importance.

Argas and spirochetes, E. MARCBOUX and L. COUVY (*Ann. Inst. Pasteur*, 27 (1913), No. 6, pp. 450-480, figs. 15).—This paper deals with the granules of Leishman.

FOODS—HUMAN NUTRITION.

Study of bacteriology of foods on a physiological basis, O. RAHN (*Centbl. Bakt. [etc.]*, 2. Abt., 37 (1913), No. 17-21, pp. 492-497, pl. 1).—In this article, which discusses the bacteriology of foods on the basis of the relation of their

chemical composition to the nature of their decomposition by micro-organisms, the amounts of acidity, carbohydrate, and protein are considered to be the three most important factors which determine the nature of the process.

The types of decomposition which may occur in seven groups of food materials containing all possible combinations of these three factors are discussed. The influence upon the nature of the decomposition of the physical structure, moisture content, and added substances is also discussed.

Meat poisoning and its administrative control, A. B. McMASTER (*Pub. Health* [London], 26 (1913), No. 10, pp. 288-295, figs. 2).—On the basis of experience, plans are outlined for the construction and operation of places where meat goods are prepared and sold in order that paratyphoid infection or similar troubles may be avoided.

Milk and its value as a popular article of diet, HERZ (*Flugschr. Deut. Landw. Gesell.*, 1913, No. 14, 2. ed., pp. 40).—A number of recipes for milk and cheese dishes are included in this discussion of the value of milk and milk products.

The nutritive and fuel value of cheeses, F. F. HERZ (*Molk. Ztg. Berlin*, 23 (1913), No. 21, pp. 243, 244).—Different kinds of cheeses are compared with other food materials with regard to cost and nutritive and fuel values.

Egg yolks of foreign origin—preservation and use, BORDAS (*Rec. Actes Off. et Doc. Hyg. Pub., Trav. Cons. Sup. Hyg. Pub. France*, 40 (1910), pp. 473-480).—This report deals with the use of egg yolks preserved with boric acid, which are imported from China and Asia Minor.

The possibility of their use in human food, especially in cake making and in oleomargarine to give it a color similar to that of butter, is also discussed. It is recommended that egg yolks which are imported for industrial purposes should be denatured by the addition of some substance which would render them unfit for human food, but not interfering with their use in the industries. Crude oil of camphor is suggested for this purpose.

It is further maintained that egg yolks intended for use as human food should not be permitted to contain preservatives.

Judging egg pastes, E. NOCKMANN (*Ztschr. Untersuch. Nahr. u. Genussmitl.*, 25 (1913), No. 12, pp. 717-726).—Analytical data are reported and discussed.

The popular cooking fat in Austria, C. L. HOOVER (*Daily Cons. and Trade Rpts.* [U. S.], 16 (1913), No. 180, p. 637).—A product commonly called "speisefett," the principal ingredient of which is palm oil, is reported as being extensively used as a substitute for lard in cooking.

The importance of ground cereals in the diet, M. KLOTZ (*Die Bedeutung der Getreidemehle für die Ernährung. Berlin*, 1912, pp. 119, figs. 3).—In this digest of data the author has discussed the general biochemistry of flours and meals, their chemical composition, their fate in the digestive tract, their relation to metabolism, their use under different conditions, and similar topics. The questions are considered very largely from the standpoint of the diet of infants and young children, and, as the author states, particular attention is paid to the varied relations of amylaceous foods and their metabolism, their fate in the stomach and intestines, and their biological significance for higher organisms.

An extended bibliography is provided.

The physical chemistry of bread, R. LORENZ (*Umschau*, 17 (1913), No. 27, pp. 549-553, figs. 12).—The physical nature of bread is discussed, particularly with reference to its growing stale. The micro-photographs which are reproduced are of special interest.

The significance of loaf volume, C. H. BRIGGS (*Northwest. Miller*, 95 (1913), No. 2, pp. 79, 80, fig. 1).—This article discusses the value of baking tests as

a means of distinguishing between flours of different quality and, also, for determining the purposes for which a flour is best suited and any special treatment it may require in fermenting and baking to give the best results.

Special reference is made to the technique employed in determining loaf volume and the results of several experiments are given.

The digestibility of bread, and in particular army bread, M. P. NEUMANN (*Ztschr. Gesam. Getreidew.*, 5 (1913), No. 4, pp. 119-129; *Landw. Vers. Stat.*, 79-80 (1913), pp. 449-463).—Experiments were made on the digestibility of dark rye bread made from flour containing from 82 to 85 per cent of the entire grain. The tests were each of 2 days' duration, and nothing was eaten with the bread, except that beer was taken in part of the tests.

According to the author's summary, the digestibility of protein was rather higher than has been reported by others, 69 per cent being retained. The author considers the full, fresh flavor and the satisfying quality of this coarse bread as important. In common with other investigators, he concludes that the digestibility of the fat could not be satisfactorily studied.

The effect of the calcium magnesium ratio in the diet with special reference to bread, R. EMMERICH and O. LOEW (*Ztschr. Gesam. Getreidew.*, 5 (1913), No. 4, pp. 115-118).—According to the authors' summary of data from their own and other experiments, too large a proportion of magnesium to calcium in the diet is undesirable. It is noted that this proportion is greater in the bran portion of wheat or whole wheat bread than in the white flour or white flour bread. According to the authors, bread, either white or black, may be improved, from a hygienic standpoint, by the addition of calcium chlorid.

On the chemical composition of polished rice, with special reference to the nutritive value of its protein matters for saké yeast and *Aspergillus oryzae*, T. TAKAHASHI and H. SATŌ (*Jour. Col. Agr. Imp. Univ. Tokyo*, 5 (1913), No. 2, pp. 135-152).—In this comparative study of rice from different districts, no new facts regarding the common constituents were brought out. "The further the whitening process is carried the less the quantity of fat becomes, and as a general rule the best rice contains least fat; there are, however, exceptions."

The rice examined contained 4 kinds of proteids, namely, albumin, globulin, prolamin, and oryzanin. Of these all except prolamin were utilized by saké yeast and *A. oryzae*.

On the physiological difference of the varieties of *Aspergillus oryzae* employed in the three main industries in Japan, namely, saké, shōyu, and tamari manufacture, T. TAKAHASHI and T. YAMAMOTO (*Jour. Col. Agr. Imp. Univ. Tokyo*, 5 (1913), No. 2, pp. 153-161).—Experimental data are reported and discussed.

Preliminary notes on the chemical composition of "miso," T. TAKAHASHI and G. ABÉ (*Jour. Col. Agr. Imp. Univ. Tokyo*, 5 (1913), No. 2, pp. 193-198).—Data are given regarding the kind and amount of cleavage products obtained from miso.

Respiration, decay, self-heating, and chemical composition of potatoes under different conditions, W. HENNEBERG (*Ztschr. Spiritusindus.*, 1912, *Ergänzungsh.* 2, pp. 15-33, figs. 4).—According to the author's conclusions, the sugar content of potatoes stored in piles apparently varies with the temperature of the pile, and is proportional to the amount of carbon dioxid present in the pile. The proportion of carbon dioxid increased with an increase in temperature, the maximum reported being 6.8 per cent.

Potatoes rich in sugar tended to decay more than those poor in this constituent.

The cooking of roots and tubers, C. H. SENN (*Jour. Roy. Hort. Soc. [London]*, 38 (1913), No. 3, pp. 540-544).—This article contains general information and gives several recipes for cooking root vegetables.

Additional notes on roselle, P. J. WESTER (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 5, pp. 223-227).—New varieties are described and data including recipes are summarized.

Canarium nut milk as a food for infants, W. G. BOORSMA (*Kanarizaden-Melk als Voedsel voor Zuigelingen. Batavia*, pp. 28; *abs. in Chem. Zentbl.*, 1912, II, No. 16, p. 1389).—The use of an emulsion made of crushed Canarium nuts (Java almonds) with water and milk sugar is favorably noted, the emulsion being mixed with cow's milk in proportions to suit the infant's age.

Biochemistry of seaweeds, H. KYLIN (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 83 (1913), No. 3, pp. 171-197; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 606, I, p. 435).—The properties are described of fucosan, the red constituent of the bladders of the Fucoideæ.

Mannitol was found in several species of *Fucus* and *Laminaria* and small quantities of dextrose and levulose were found in several species of Fucoideæ but in none of the Florideæ. Some of the Fucoideæ contained laminarin, a polysaccharid built up from dextrose and analogous to starch in the higher plants.

The Florideæ contain starch, which gives dextrose when boiled with dilute acids and is quickly hydrolyzed by malt diastase.

The seaweeds are rich in slimy cell-wall constituents, such as algin, fucidin, and similar products, which are described.

Tea infusions and their constituents, H. L. SMITH (*Pharm. Jour. [London]*, 4, ser., 36 (1913), No. 2593, pp. 897, 898).—Tests were made to determine whether or not the belief is correct that water used for tea making should not be too hard.

From the results, "it is evident that the extraction of caffeine is unaffected by the hardness of the water, but there is distinctly less tannin extracted by hard waters in the case of Ceylon and China teas [than from Indian tea]. The addition of sodium bicarbonate increases the amount of tannin extracted, but such an infusion does not precipitate gelatin."

From further tests, it appeared "that the tannin of China tea is not so readily extracted as the tannin of Indian and Ceylon teas. . . . Further work is being carried out which, it is hoped, may throw more light on this subject."

See also previous note (*E. S. R.*, 29, p. 463).

Nascent ozone as a preserving agent of foods, A. ÉLOIRE (*Rec. Méd. Vét.*, 90 (1913), Nos. 7, pp. 237-239; 11, pp. 385-388).—The author discusses the possibility of using nascent ozone as an aid to or a substitute for refrigeration in the preserving of meats, fish, and other perishable foods. It is claimed that ozone formed from the air by means of an ozonizer placed in the storage room or car destroys the micro-organisms present in the air and upon the foods and thus prevents decomposition of the foods without any injury to them.

Food inspection decision (*U. S. Dept. Agr., Food Insp. Decision 151, p. 1*).—This decision applies the Food and Drugs Act of June 30, 1906, to meat and meat food products prepared, transported, or sold in interstate or foreign commerce, under the meat inspection law.

Food and drug laws of Louisiana (*[Baton Rouge, La., 1913]*, pp. 31).—This includes the food and drug laws and the food and drug regulations adopted by the Louisiana State Board of Health, as effective July 1, 1913.

Laws enforced by food and drug department of the State of South Dakota (*Vermilion, S. Dak., 1913, pp. 57*).—This pamphlet contains the text of the

pure food, drug, paint and oil, and feeding stuffs laws, together with those regulating the inspection of hotels and public buildings.

[Pure food and drug report], W. A. McRAE ET AL. (*Bien. Rpt. Dept. Agr. Fla.*, 12 (1911-12), pp. 7-54).—Legislative enactments, standards of purity, analytical and inspection work, and similar data are included, as well as a relatively small amount of material which deals with feeding stuff work.

[Food inspection], W. D. SAUNDERS (*Dept. Agr. and Immigr. Va., Dairy and Food Div. Bul.* 28, 1913, pp. 1-66, 100-127, pls. 5).—This bulletin, which constitutes the Fourth Annual Report of the Dairy and Food Commissioner of Virginia, contains the results of the inspection of dairies, bakeries, cold storage and packing plants, and other similar places, together with the results of the examination of miscellaneous food products.

A hygienic interpretation of the food supplied the United States Army in the field as at present authorized, A. A. WOODHULL (*War Dept. [U. S.], Off. Surg. Gen. Bul.* 2, 1913, pp. 120-123).—This article considers the food value of the various army rations.

Food values and living on threepence a day, F. J. CROSS (*Reporter Proc. Council [Charity Organ. Soc. London]*, 1913, pp. 1-10).—In this paper and the discussion which follows information is given regarding the kind and cost of food used by poor families in England and Scotland, and suggestions are made for bettering the diet.

English cookery books to the year 1850, A. W. OXFORD (*London, Edinburgh, and New York.* 1913, pp. 192; *rev. in Brit. Med. Jour.*, 1913, No. 2735, p. 1166).—A collection of titles of cookery books which appeared from 1500 to 1850, together with data gathered from them, including matter which bears on domestic economy. See also a previous note (*E. S. R.*, 22, p. 167).

Traveling kitchens, N. D. WALKER (*Jour. Roy Army Med. Corps*, 20 (1913), No. 3, pp. 248-274, figs. 12).—Descriptions are given of different sorts of portable kitchen equipment for army use, including devices which employ the fireless cooker principle. A bibliography is appended.

An electrical oven, K. MOHS (*Ztschr. Gesam. Getreidew.*, 5 (1913), No. 5, pp. 152-155, figs. 2).—An electrical oven for bakers' use is described and some data given regarding its efficiency.

A temperature regulator, E. ESCLANGON (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 22, pp. 1667-1670, figs. 3).—A temperature regulator for experimental purposes is described by means of which the heating is increased or decreased by the disturbance of the center of gravity of the apparatus through the movement of a column of mercury, due to expansion or contraction of a body of vapor with which it is in contact. The regulator is especially useful in bacteriological work.

The effect of light on metabolism, L. PINCUSOHN (*Berlin. Klin. Wchnschr.*, 50 (1913), No. 22, pp. 1008, 1009).—The results of preliminary experiments are reported in which the metabolism was studied of a dog exposed to strong light.

The mechanism of protein assimilation (*Jour. Amer. Med. Assoc.*, 60 (1913), No. 20, p. 1546).—This is a brief summary of recent studies which apparently show that the amino acids resulting from protein digestion are absorbed from the blood by the tissues and held there by physical means in amounts varying with the different tissues, being transformed chemically later on.

Since the retained amino acids disappeared much more rapidly from the liver and kidneys than from the muscles and the other organs, this disappearance being accompanied by an increase of urea in the blood, it is probable that the entire task of removing the products of digestion from the blood stream when the other tissues become saturated devolves on these two sets of organs.

Products of protein cleavage which produce fatigue, and their influence. W. WEICHARDT and E. SCHWENK (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 83 (1913), No. 5, pp. 381-402; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 606, I, pp. 422, 423).—"From the muscle proteins, by means of electrolysis, certain high molecular products were obtained which cause, when injected into animals (mice) certain toxic symptoms, such as the signs of fatigue, slowing of the respiration, and depression of the body temperature.

"The effect of these keno-toxins, as they are termed, can be counteracted by a number of substances of which the chemical composition is known, for instance, succinimid, glutarimid, phthalimid, piperidin, creatin, guanidin hydrochlorid, and others. The same effect is produced by a group of substances of unknown composition which are spoken of as retardins; these can be extracted by acetone from digested protein. Further work on the relationships between activity and chemical composition is promised."

The preparation from animal tissues of a substance which cures polyneuritis in birds induced by diets of polished rice, I, EVELYN A. COOPER (*Biochem. Jour.*, 7 (1913), No. 3, pp. 268-274).—According to the author's summary of her investigations, a fraction rich in the antineuritic substance can be precipitated from the fats and lipoids (alcoholic extracts) of various animal tissues by means of ether. A method based on this observation is described for isolating a substance from horseflesh, which, in small amounts, can cure polyneuritis in pigeons. The properties of this substance are described.

Some data regarding the effect of drugs on polyneuritis are also reported.

The influence of nutrition on the amylase content of human saliva, C. L. EVANS (*Biochem. Ztschr.*, 48 (1913), No. 6, pp. 432-447; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 606, I, pp. 418, 419).—In from 20 to 30 minutes after a meal an increase was noted in the amylase content of the saliva. This lasted from 2 to 3 hours, when it reached a maximum and then decreased, the activity remaining small until the next meal was taken.

Mastication of the food without swallowing produced no effect on the amount of amylase, and this was likewise the case when a meal containing only protein was taken. The mechanism of the secretion was explained by the assumption that the carbohydrates in the food acted on the mucous membrane of the stomach, producing a "hormone" which stimulated the salivary glands. The increase in the amylase content was ascribed principally to the saliva produced by the parotid gland, which has about four times the enzymic activity of the other glands and which furthermore produces about half the total volume of the saliva.

Notes on the chemistry of feces, L. GRIMBERT (*Jour. Pharm. et Chim.*, 7, ser., 5 (1912), Nos. 9, pp. 450-456; 10, pp. 494-505).—The author considers the influence of different kinds of food on the general character of feces, the analysis of feces, and the interpretation of analytical data.

The absolute efficiency of the muscular contraction, A. V. HULL (*Jour. Physiol.*, 46 (1913), No. 2, pp. XII, XIII).—A number of factors are discussed which should be considered in the determination of the maximum value of the efficiency of a muscle in absolute units.

Some effects of muscular exercise on women, GLADYS HARTWELL and NORA TWEEDY (*Jour. Physiol.*, 46 (1913), No. 2, pp. IX-XI, figs. 2).—Observations were made of the normal ventilation, pulse, and blood pressure of 54 subjects while at rest and immediately after exercising actively for 45 seconds. The pulse rate was recorded every 15 seconds after the exercise until it had returned to normal.

It was noted that the rate of return to normal was much more rapid in the case of athletic than nonathletic women students.

Some notes on the form of the curve of carbon dioxid excretion resulting from muscular work following forced breathing, G. O. HIGLEY (*Biochem. Bul.*, 2 (1913), No. 7, pp. 390-392, pl. 1).—In the case of one of the two subjects studied the curve for rate of excretion of carbon dioxid returned during the period of forced respiration to practically the original value.

"With the other subject the return was less perfect. It would seem that as a result of the additional work of the respiratory organs a return of the rate of excretion to the value during normal respiration could not be expected."

The influence of barometric pressure on carbon dioxid excretion in man, G. O. HIGLEY (*Biochem. Bul.*, 2 (1913), No. 7, pp. 393-402, pl. 1).—According to the author's summary of his results, there were indications of an influence of barometric change on the carbon dioxid excretion of one of his 3 subjects and a slight influence in the case of another. With the third, negative coefficients were obtained.

"The barometric change is evidently a minor influence and its effect is therefore liable to be masked by other influences, such as exercise, amount and character of meals, etc." The effect upon muscular endurance noted by another observer was not verified. "The writer is of the opinion that if a series of parallel ergographic and respiration experiments were made on a number of subjects, it would be found that positive effects of barometric changes on muscular endurance are accompanied in general by positive coefficients of correlation of barometric change with rate of excretion of carbon dioxid."

Calorimetric experiments on warm-blooded animals, A. V. and A. M. HILL (*Jour. Physiol.*, 46 (1913), No. 2, pp. 81-103, figs. 3).—A detailed description is given of a respiration calorimeter designed for experiments with small animals.

The calorimeter consists essentially of a Dewar flask which contains the animal under observation and a water coil for carrying away the heat produced by the animal. The amount of heat gained by the water in passing through the calorimeter is measured by means of a thermopile and recorded upon an automatic registering galvanometer, thus giving a continuous record of the heat produced by the subject.

In experiments with fasting animals it was found that the ratio of heat production to body weight was quite constant for animals which were more than one-third the size of a full grown animal. In the case of smaller animals the heat production per gram rose rapidly as the animals decreased in weight. It was found that animals kept together in twos or threes showed a smaller heat production per gram of body weight than when they were kept separately. This was probably due to the fact that the animals were less active under these conditions. It is suggested that this fact may be of importance in the nutrition of young animals since, with a given diet, if the heat production is less when the animals live together they will grow faster under these conditions.

ANIMAL PRODUCTION.

Some new or little-known leguminous feeding stuffs (*Bul. Imp. Inst. [So. Kensington]*, 11 (1913), No. 2, pp. 230-243).—Analyses are reported of a number of comparatively new leguminous feeding stuffs, including beans from the Sudan, pigeon peas, velvet beans, lentils, etc.

Monketoos as a cattle food, E. W. L. NOAKS (*Rhodesia Agr. Jour.*, 10 (1913), No. 5, pp. 726, 727).—A comparison is made of the feeding value of Monketoos and the American stock melons in which the former is reported as showing a moisture content of 92.39, protein 0.74, and fat 0.75 per cent, and a

fuel value of 144 calories per pound as compared with 94.12, 0.5, and 0.15 per cent, respectively, and 79 calories fuel value for the stock melon.

Nutrients in green shoots of trees, E. J. PETRY (*Proc. Ind. Acad. Sci.*, 1911, pp. 321-324).—Analyses are reported of air-dry and green samples of shoots from 24 species of trees and undergrowth. The author states that "these shoots compare very favorably with the other green feeds usually fed." Several of these species show a favorable protein content.

Molasses as a feeding material, S. WEISER (*Österr. Ungar. Ztschr. Zucker-indus. u. Landw.*, 42 (1913), No. 3, pp. 462-521).—The author gives analyses of various kinds of molasses, discusses the value of molasses as a feed for stock, and summarizes the results of previous experiments in the feeding of cattle, sheep, horses, and swine. There is included a list of a number of rations combining grain and molasses in various proportions.

Analyses of feeding stuffs, B. L. HARTWELL (*Rhode Island Sta. Insp. Bul.* 1913, May, pp. 2-16).—Analyses are reported of meat and bone scrap, cottonseed meal, linseed meal, gluten feed, malt sprouts, brewers' grains, middlings, bran, mixed feeds, hominy feed, corn meal, chopped alfalfa, alfalfa meal, dried beet pulp, and horse, dairy, stock, and poultry feed.

Studies in methods of developing stock-watering places, J. T. JARDINE (*U. S. Dept. Agr., Rev. Forest Serv. Investigations*, 2 (1913), pp. 29-32).—Methods of cleaning and fencing a spring hole, the construction and placement of troughs, and other subjects related to stock watering in the forest reserves are considered.

Text-book of animal production, G. PUSCH (*Lehrbuch der Allgemeinen Tierzucht*. Stuttgart, 1911, 2. ed., rev. and enl., pp. XV+480, figs. 219).—The first edition of this work has been previously abstracted (*E. S. R.*, 16, p. 586).

Reversion in animal breeding, E. N. WENTWORTH (*Breeder's Gaz.*, 64 (1913), No. 5, pp. 168, 169).—The author discusses the problem of reversion with reference to practical animal breeding operations and shows wherein this character "as a definite and deleterious force does not probably exist, the appearance being due to the simple forces at work in normal heredity." It is further contended that "reversion is not something which breeders must feel is a force fighting their efforts, but instead is a customary operation of the same laws by which their progress comes."

Investigations on the form and functioning duties of the tendons of the limbs of work animals, R. DISSELHORST (*Kühn Arch.*, 3 (1913), pt. 1, pp. 1-5).—The author reports investigations on the form and function of the tendons of Achilles and of the anterior limb of the horse and ox, and of horses of different degrees of purity of breeding. It was found that the specific weights of these tendons were lower in older animals and uniformly higher in the flexor tendon of the posterior limb than in the anterior limb, and that the specific weight of the tendon was higher in pure-bred than in mongrel horses.

[Animal industry in Russia], T. LARRASS and AUHAGEN (*Jahrb. Deut. Landw. Gesell.*, 28 (1913), No. 1, pp. 176-202, pls. 2).—An account of sheep breeding and general animal production in Russia.

[Live stock in Australia] (*Rpt. Scot. Agr. Com. Aust.*, 1910-11, pp. 190-228, figs. 11).—In this report a résumé is given of live stock conditions in Australia, with an account of the different breeds of cattle and sheep and the extent of the wool industry in that country.

Cattle raising in Jamaica, T. G. M. ROBERTSON (*Bul. Dept. Agr. Jamaica, n. ser.*, 2 (1913), No. 6, pp. 155-158).—An account of the advantages accruing from the crossing of pure and half-bred Shorthorn, Hereford, and Devon bulls with native Indian stock. Calf mortality is said to be lessened and the beef quality increased.

British breeds of live stock (*London: Bd. Agr. and Fisheries, 1913, 2. ed., pp. 146, pls. 44*).—A complete account of the history, distribution, show records, and capabilities of the leading breeds of horses, cattle, sheep, and swine in Great Britain.

[**Devon and South Devon cattle**], S. KIDNER and R. DRENNAN (*Jour. Roy. Agr. Soc. England, 73 (1912), pp. 46-65, figs. 4*).—Two articles dealing with the history, distribution, breed characteristics, management, and dual purpose capabilities of these 2 breeds of English cattle are presented.

Welsh black cattle, P. SABORSKY (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien, 1 (1913), No. 4, pp. 511-584, tables 8, pls. 22*).—This is a study of the black cattle of Wales in which the author presents a very complete description of the body characteristics of this breed of cattle. Measurements were made of the head, horns, rump, limbs, chest, shoulders, pelvis, and other parts of a large number of animals, and a comparison is given with similar measurements of other breeds.

The author comments on the probable origin of these cattle and their relation to the Park cattle of England, considers the distinguishing features of the cattle of North and South Wales, and discusses the weights, milk production, and general management of these cattle at some length.

Life and environments of the breeds of cattle of Italy, A. FRANCHI (*Mod. Zootro, Parte Sci., 1913, No. 5, pp. 170-195, figs. 10*).—A general résumé of the Italian breeds of cattle and their breed characteristics.

Similarities of the Gayal and Gaur [breeds of cattle], H. SCHUMANN (*Kühn Arch., 3 (1913), pt. 1, pp. 7-80, figs. 6*).—This is an extended treatise on the measurements and body characteristics of the Indian breeds of cattle, Gayal and Gaur.

Supply of store cattle and slaughter of young calves (*Bd. Agr. and Fisheries [London], Leaflet 272, pp. 8*).—Attention is called to the high price and apparent scarcity of store cattle in Great Britain and to the fact that a large proportion of the calves are being slaughtered while quite young. It is noted that "the farms in which the cattle industry is carried on are to a great extent sharply divided into 3 classes: (1) dairy farms, on which the majority of the calves are bred, but where few are reared; (2) rearing farms, on which calves, both home-bred and purchased, are reared but not fattened; (3) fattening farms, where purchased store cattle are fattened." This segregation accounts in part for the apparent scarcity of market cattle.

Baby beef, E. E. SCHOLL (*Texas Dept. Agr. Bul. 30, 1913, pp. 58, figs. 6*).—The author reviews the beef situation in Texas and discusses the adaptability of the baby-beef industry to that section and the various problems connected with the marketing of live stock. Methods of baby-beef production are taken up and a résumé of the results of experiment station work is given. The organization of "baby-beef clubs" is considered and plans for such organizations are included.

Calf rearing (*Abs. in Jour. Bd. Agr. [London], 20 (1913), No. 3, pp. 240, 241*).—In experiments conducted at the Woburn Experimental Farm 5 lots of 4 each of approximately 3-weeks-old Shorthorn bull calves, previously reared on whole milk, were fed 9 weeks on the following feeds: "Lot 1, cod-liver oil and separated milk; lot 2, a purchased 'calf meal' along with whole milk and separated milk; lot 3, gruel consisting of 6 lbs. fine oatmeal and 1 lb. linseed to 1 gal. of water, with separated milk; lot 4, whole milk; lot 5. crushed oats given dry and separated milk."

Following this feeding period the calves were turned out and all fed alike with separated milk, a little linseed cake, and crushed oats; later the milk

was discontinued and the oats and hay increased. All the calves were castrated when about 6 months old and then fed throughout the winter on linseed cake, cotton cake, hay, and sliced roots. During this period the calves were weighed twice, with the results seen in the following table:

Calf-rearing experiments.

First feeding period, 9 weeks.			Second feeding period, 7½ months.
Lot.	Gain per calf per week.	Cost per pound of gain of live weight.	Average gain per calf daily.
	<i>Pounds.</i>	<i>d.</i>	<i>Pounds.</i>
1	9.66	3.33	1.74
2	8.66	2.77	1.62
3	8.33	3.45	1.84
4	12.83	5.39	1.94
5	13.30	2.52	2.00

"It is concluded that the early feeding of calves has an important bearing on their after development, and that a 'good start' is very essential. The improvement effected by the early feeding with dry crushed oats was thus maintained for a period of quite 7 months after the special feeding had been dropped."

Feeding value of lupine flakes, A. STUTZER and S. GOY (*Landw. Vers. Stat.*, 79-80 (1913), pp. 219-228, fig. 1).—Experiments in feeding sheep on lupine flakes indicated the high nutritive value of this feed.

The cost of mutton production, C. S. PLUMB (*N. Y. Dept. Agr. Bul.* 35, 1912, pp. 1056-1070).—This is a general summary of experiment station work on the cost of mutton production and of the experiences of practical feeders. The cost of fattening range lambs, a comparison of whole shelled corn and clover hay, alfalfa as a feed for sheep, advantages of silage for sheep and lambs, and the cost of fattening wethers are some of the subjects considered.

Dorset Horn sheep, T. H. ENSOR (*Jour. Roy. Agr. Soc. England*, 73 (1912), pp. 66-73, figs. 2).—An account of the history, ancestry, breed characteristics, management, and market value of the Dorset Horn breed of sheep. Favorable results were obtained from the crossing of Dorset Horn ewes with a Southdown ram, this resulting in earlier maturity and increased market qualities.

The Tasmanian Merino, CAMDEN (*Pastoral Rev.*, 23 (1913), No. 7, pp. 637-640, figs. 7).—An account of the foundation, history, and purity of descent of this distinct strain of Merino sheep.

Fat-tailed sheep, J. C. EWART (*Rpt. Brit. Assoc. Adv. Sci.*, 1912, pp. 512, 513).—The author contends that "all true wild sheep are characterized by a short tail," and that "there is no evidence that long-tailed sheep, with or without a store of fat, are descended from long-tailed wild ancestors." It is suggested that environment and domestication have played an important part in determining these characters.

On the nutritive value of banana meal for fattening swine and the influence on the quality of the dressed carcass, S. ZILVA (*Kühn Arch.*, 3 (1913), pt. 1, pp. 129-168).—Experiments in feeding banana meal to fattening swine indicated that this feed is highly digestible, especially when prepared from the ripe banana. It seemed to have a special influence on the muscle fibers, rendering the flesh and fat of a softer consistency than where the hogs are fed on

potato flakes. Banana meal is high in starch and carbohydrates but low in fiber, fat, and ash, and as the protein content is not large it should be fed in conjunction with protein-rich feeds. The principal ash constituents are calcium and phosphorus.

Pork production under California conditions, J. I. THOMPSON (*California Sta. Bul.* 237, pp. 559-580, figs. 15).—This is a popular account dealing with the breeds and types of market hogs, buildings, the selection and management of breeding stock, feeding trials with various rations composed of California feeding stuffs, and minor diseases and treatments.

In an experiment "to ascertain whether or not hogs of the conformation desired by packers, when fed a grain ration continually until properly finished, would bring a relatively higher price than hogs showing less finish," 2 lots of 38 pigs were fed various proportions of rolled barley, alfalfa, and molasses. The lot receiving the greater amount of barley, together with an addition of skim milk, weighed 4,040 lbs., sold for 9.125 cts. per pound, and dressed out 80.7 per cent, while the other lot weighed 2,925 lbs., sold for 8.805 cts. per pound, and dressed out 78.7 per cent. The barley marketed by feeding to the first lot brought 33 cts. per 100 lbs. more than that fed the other lot.

Desirable rations for sows, nursing pigs, and for growing market pigs are presented.

Prague hams—meat prices, J. I. BRITAIN (*Daily Cons. and Trade Rpts.* [U. S.], 16 (1913), No. 195, pp. 1034, 1035).—An account of the curing of hams in Prague. The hams coming from prime animals about one year old are soaked in brine for 6 weeks and afterwards hung in beechwood smoke for about 8 hours. The meat is said to have a fine flavor and to be very tender.

The horse, R. F. MEYSEY-THOMPSON (*London, 1911, pp. XII+436, pls. 30, figs. 42*).—This is a very comprehensive work on the origin and development of the different types of modern-day horses. Chapters are devoted to the selection, care, management, and training of the horse.

Moorland ponies, T. PALMER and A. C. MARDON (*Jour. Roy. Agr. Soc. England, 73* (1912), pp. 38-46, figs. 2).—This is an account of the history, breed characteristics, and utility value of Dartmoor and Exmoor ponies.

Improvement of Mountain and Moorland breeds of ponies, A. CECIL ET AL. (*London: Bd. Agr. and Fisheries, 1912, pp. 41*).—This is a report of a committee appointed to investigate the history, breeding, economic value, and importance of the Mountain and Moorland breeds of ponies, and to advise as to the measures to be adopted for their improvement. The committee's recommendations include the registration and recognition of these breeds, the awarding of premiums, the encouragement of more extensive use of pony-bred stallions, and the minimizing of inbreeding.

Government horse breeding in France and Hungary, S. BORDEN (*Jour. U. S. Cavalry Assoc., 24* (1913), No. 57, pp. 43-64, figs. 4).—An account of government methods of encouraging improved horse breeding in these countries.

Horse industry in Algiers, G. TROUETTE (*Gouv. Gén. Algérie, Dir. Agr., Inform. Agr. Bul. 15, 1913, pp. 64, figs. 8*).—An account of the horse-breeding industry in Algiers with special reference to government encouragement of improved breeding.

Farm poultry, G. C. WATSON (*New York and London, 1912, rev. and enl., pp. X+369, figs. 104*).—This volume treats of poultry raising as a business and discusses the various breeds of fowls with regard to their utility purposes. The raising of ducks, geese, turkeys, guineas, peafowls, and pigeons for market purposes is considered.

Poultry notes, A. F. ROLF (*Georgia Sta. Bul. 102, pp. 265-291, figs. 7*).—This bulletin describes the construction of inexpensive poultry houses, and in-

cludes items on diseases of poultry. An experiment, in which a White Leghorn pullet infected with cloacitis or vent gleet was treated with Neisser-Bacterin mixed vaccine apparently warranted further trials with this remedy. The use of Vetol, a proprietary remedy for impotency, showed no effect on poultry. The treatment of 3 cases of roup with Oculum indicated favorable results.

Hatching and rearing of chicks, J. E. DOUGHERTY (*California Sta. Circ.* 99, pp. 2-20, figs. 5).—This circular treats of vigor in breeding stock, and the selection, age, care, and management of breeders. Problems of natural and artificial incubation are discussed. Formulas for a lice powder and a cresol disinfectant are given.

Rearing chickens, H. R. LEWIS (*New Jersey Stas. Circ.* 22, pp. 2-8).—This is a popular circular dealing with incubator and brooder practice, feeding methods, growing, housing, and general chicken management.

Winter egg production, H. R. LEWIS (*New Jersey Stas. Circ.* 23, pp. 3-11).—A popular circular dealing with the best methods of housing, feeding, and caring for chickens for winter egg production. Rations used by the station are included and suggested for trial.

Report of the poultry expert, D. F. LAUBIE (*Rpt. Dept. Agr. So. Aust.*, 1912, pp. 59-72).—In experimental work testing the fertility of eggs it was concluded that "the influence of the male bird extends strongly for a fortnight, and that at least 3 weeks should elapse before the effect due to change of male bird can be relied upon." This demonstrates the danger arising from the changing of males at intervals, especially where an accurate knowledge of the pedigree is required.

The author states that "size of eggs does not appear to be sex limited, that is, either parent will transmit. . . . In mating stock for egg production the tested hens selected should be layers of eggs of the size required and should be the progeny of (1) hens which laid eggs of similar size, and (2) of sires descended from hens which had laid eggs of the desired size. The male bird selected should have an equal pedigree for several generations."

Market poultry, H. E. UPTON (*Brit. Columbia Dept. Agr. Bul.* 49, 1913, pp. 23, figs. 22).—A bulletin dealing with the production and marketing of fat poultry, comparing the several breeds of poultry for market purposes and outlining a method of judging good feeder stock. The crate method of fattening is considered and rations for rapid and profitable gains are given. Methods of dressing market poultry, shaping, cooling, packing, and marketing are explained.

Report on the poultry industry in Germany, E. BROWN (*London: Nat. Poultry Organ. Soc.*, 1912, pp. IX+124, pls. 15).—This report deals with the modern development of the poultry industry in Germany, with especial emphasis on the influence of German products on British supplies. Methods of poultry keeping and general production are discussed in detail.

Money in Reds, E. T. DE GRAFF (*Amsterdam, N. Y.*, 1913, pp. 36, pls. 4, figs. 54).—This pamphlet deals with poultry management and a discussion of the American Standard of Perfection as applied to Rhode Island Red fowls.

Large eggs in South Manchuria, A. A. WILLIAMSON (*Daily Cons. and Trade Rpts.* [U. S.], 16 (1913), No. 193, p. 1005).—It is reported that "hardy hens of this region lay eggs that average, according to the hen, from 5 to 7 to the pound, and 6 to the pound is common and usual." It is noted that "it might be possible to improve the size of American eggs by the introduction and careful breeding of some of the fowls referred to, if American poultrymen are interested."

All about Indian Runner ducks, MRS. D. O. TEASLEY (*Middletown, Ind.*, 1912, pp. 3-92, figs. 13).—A compilation of general articles on the history, breeding, feeding, and general care of Indian Runner breed of ducks.

Ostrich farming in Australia, T. J. HERBERT (*Agr. Gaz. N. S. Wales*, 24 (1913), No. 6, pp. 511-521, pl. 1, figs. 4).—An account of methods of rearing, care, and management of ostriches for commercial purposes.

Crosses between pheasants and fowls, J. R. AINSWORTH-DAVIS (*Agr. Students' Gaz.*, n. ser., 16 (1913), No. 4, p. 120).—A report of work on hybridization conducted at the Royal Agricultural College, Cirencester.

It is stated that no fertile hybrids have so far been obtained, and that most individuals die at an early age. A female "neither laid eggs nor showed any of the usual signs of sexuality. On dissection, the ovary was found to be extremely rudimentary, no ovarian follicles being visible to the naked eye.

On sterile and hybrid pheasants, G. SMITH and MRS. H. THOMAS (*Jour. Genetics*, 3 (1913), No. 1, pp. 39-52, pl. 1).—Investigations carried out to determine the causes for sterility in pheasants are summarized by the authors as follows:

"Evidence is brought forward to show that the sterility of the male and female hybrid pheasants is due to abnormalities occurring at the synapsis stage of the reduction division. The spermatozoa of the hybrids are either deformed, with chromatic beads and thickenings on them, or else of abnormal size, double-sized spermatozoa being of frequent occurrence as in hybrid pigeons. The oocytes in the hybrid females fail to grow owing, probably, to the early synapsis which should take place in the 19-day-old embryo having gone wrong.

"Partial assumption of cock's plumage by the female as the result of ovarian degeneration is shown to be of fairly common occurrence. The oviduct in these cases may be either atrophied or greatly hypertrophied. Assumption of hen's plumage by the cock bird is much rarer and is generally due to hereditary transference of this character independently of any disturbance of the testes or the reproductive function. The sex ratio among hybrid pheasants gives a large preponderance of males over females (228 males to 135 females). This preponderance can not be accounted for by a greater death rate of female chicks in the shell or subsequently, and must be presumably due to a selective fertilization by which more male zygotes are produced than female, or else to a selective death rate at so early a state of development that no trace of an embryo could be detected."

DAIRY FARMING—DAIRYING.

Feeding dairy cows, T. L. HAECKER (*Minnesota Sta. Bul.* 130, pp. 7-43).—A popular treatise on the feeding of dairy cows in which the author reviews the dairy situation in the State of Minnesota and outlines the main essentials in formulating desirable rations for dairy cows. The author's feeding standard is explained, and tabular data presented in detail for its use. The problem of balancing rations is considered from a practical standpoint, and sample rations are given.

The author discusses the feeding of silage and roots and their relation to the balanced ration. Several suggestions are appended on the proportion of roughage to concentrates to be fed, palatability of feeds, order of feeding, feeding of cows when dry, and other related subjects. There are also included cost computing tables, a feed weight table, and a gestation table.

Sorghum crops for silage.—Feeding experiments with dairy cattle, O. E. REED and J. B. FITCH (*Kansas Sta. Circ.* 28, pp. 6).—This circular reports comparative feeding experiments with corn, sweet sorghum or cane, and Kafir corn silage as feeds for dairy cows.

During 1911-12, 2 lots of 4 cows each were fed in three 20-day periods, lot 1 alternating in the order of corn, cane, and corn silages, and lot 2, cane, corn,

and cane silages, with a period of 10 days intervening between periods. The cows received a practically constant grain and hay ration in addition to the silage during the experiment. The results obtained were as follows: In lot 1 the average production of milk and butter fat proved practically equal for the corn and the cane silage periods, although the increase in body weight favored the cane silage. In lot 2 the butter fat production was the same for both silage feeds, but with the corn silage there was a total increased milk production of 76 lbs. over the cane silage, while the cane silage apparently materially increased the body weights of the cows.

During 1912-13, 3 lots of cows were fed in three 30-day periods and under similar conditions as the previous experiment except as to silage feeds. Lot 1 alternated on Kafir corn, corn, and Kafir corn silage, and showed a slight advantage of 27 lbs. in total milk yield for the corn silage. The rations were equal as to effect on butter fat production but 21 lbs. greater body weight resulted on the Kafir corn silage. Lot 2, alternated on cane, Kafir corn, and cane silages, produced a total increased yield of 231 lbs. milk and 10 lbs. butter fat on the Kafir corn silage, although the cane silage again showed to advantage in body weight. Lot 3, alternated on corn, cane, and corn silages, made 70 lbs. increased milk yield and 1 lb. butter fat in the case of the corn silage, while the body weight remained practically the same.

It is concluded that these feeds rank in the order of corn silage, Kafir corn silage, and cane silage, as milk producers. The authors suggest that cane silage would show to better advantage where supplemented with more protein and less fat-forming nutrients in the grain ration.

"During both trials the acidity of the cane silage was never more than that of the corn silage. In the second trial the average acidity for the 3 different kinds of silage was as follows: Corn 2.03, cane 1.46, and Kafir corn 1.43 per cent." It is stated that the quality of silage obtained from all crops was very good; that the cows ate the silage with relish; and that the cane silage seemed most palatable. It is further noted that the cane and Kafir crops should be practically mature before ensiling.

Milk production, II, J. M. SCOTT (*Florida Sta. Bul. 114*, pp. 61-76, fig. 1).—This is a continuation of work previously noted (E. S. R., 21, p. 673), and is a report of experiments conducted to determine the values of different Florida-grown feeds for milk production.

Two lots of 3 cows each were fed in 3 periods of 21 days each, the lots alternating and a 7-day period intervening between the feeding periods. A basal ration of wheat bran and sorghum silage was fed, the special feeds under comparison being velvet beans in the pod and cotton-seed meal, which were fed in quantities containing approximately equivalent amounts of nutrients. On the average, the ration containing 267.75 lbs. of velvet beans produced 934.6 lbs. milk, and that containing 94.5 lbs. cotton-seed meal produced 937.1 lbs. It is estimated that 2.63 lbs. of velvet beans is equivalent to 1 lb. cotton-seed meal. During these tests the body weights of the cows remained about the same. It is estimated that the velvet bean ration produced milk costing 13.3 cts. per gallon, while the cotton-seed meal ration cost 13.7 cts. per gallon.

In another experiment 2 lots of 3 cows each were fed in 4 periods of 16 days each, lots alternating and a 5-day period intervening between feeding periods. The rations fed in this test were similar to those in the first experiment except as to quantity of feed. The cotton-seed meal daily allowance was increased from 1.5 to 3 lbs., and less silage was given the velvet bean fed lot than that on cotton-seed meal. In this test, the use of 816 lbs. of velvet beans in the pod produced practically the same quantity of milk as 576 lbs. of cotton-seed meal. The cost per gallon of milk with the velvet bean ration was 12.7 cts.,

and with the cotton-seed meal ration 15.6 cts. It is estimated that if cotton-seed meal is worth \$1.55 per 100 lbs., velvet beans in the pod are worth \$1.09.

A table is appended showing age, breed, milking period, milk yield, and percentage of butter fat of the cows under test. A table is also given showing the comparative returns from milk, cream, and butter. The average production of 12 cows for a period of 12 months was, milk yield 2,594.7 lbs., percentage butter fat 4.85, value of milk at 30 cts. per gallon, \$90.50, value of cream at \$1 per gallon (20 per cent butter fat), \$74.15, and value of butter at 40 cts. per pound, \$57.43. In this no account has been taken of the buttermilk or skim milk.

Another table shows the returns from individual cows for 6 months.

Winter fodder of milch cows in Denmark, J. J. DUNNE (*Hoard's Dairyman*, 45 (1913), No. 25, pp. 832, 839).—An article dealing with the feeding value and methods of feeding of mangolds, rutabagas, and other root crops for milk production, and of the use of peanut cake, cotton cake, soy cake, sunflower cake, and other oil-bearing cakes in the dairy ration. Tables are given suggesting the proper amounts of these and other feeds for cows of varying milk yield, also showing the percentage of carbohydrates, the pounds of roots which constitute a feeding unit, and the effect of the soil upon the carbohydrate content of the various root crops.

Selection and feeding of dairy cows, LUCAS (*Indus. Lait. [Paris]*, 38 (1913), Nos. 16, pp. 253-259, figs. 5; 17, pp. 269-273, figs. 19; 18, pp. 285-288; 19, pp. 301-305).—The author discusses the importance of breed, conformation, quality, udder form and placement, ancestry, age, and influence of feeding of the dairy cow upon milk production. There is included a table containing forage equivalents, and a method for computing rations according to milk yield is explained.

Studies in milk records: The influence of fetal growth on yield, W. GAVIN (*Jour. Agr. Sci. [England]*, 5 (1913), No. 3, pp. 309-319, figs. 4).—With a view to selecting a figure definitive of a cow's milking capability and affected by the minimum number of influences (age of cow, length of lactation period, etc.) the author proposes the maximum day-yield 3 times reached or exceeded as the most satisfactory figure. This he terms the "Revised Maximum" or R. M. This shows less variation than other figures that might be taken, is outside the influences of length of lactation and time of service, and is but slightly affected by other factors.

In this connection investigations were made to determine the time after calving at which the maximum yield occurs and the time after service at which fetal growth begins to reduce the milk yield. Of 1,421 records examined, 84 per cent of the total number of cows had reached their maximum day yield by the eighth week after calving, 92 per cent by the twelfth week, and 97 per cent by the sixteenth week. Of 247 records examined, 97 per cent of the cows had reached their maximum day yield within 16 weeks of calving, and 99 per cent within 20 weeks. The author concludes that from this it is evident that the chances of the "Revised Maximum" being affected by time of service are very slight. Plotted curves show the difference in fall in milk yield of non-pregnant cows and cows sustaining fetal growth. In the former the fall is gradual, while in the latter the fall is very rapid 16 weeks after service.

The score card as a factor in judging dairy cows, R. JENSEN (*Hoard's Dairyman*, 45 (1913), No. 22, p. 760).—In an investigation carried on at the University of Missouri, 88 cows were scored and a comparison of scores made of the different breeds as well as with the actual productivity of the cows. It is shown wherein points of conformation are given different scoring values for the different breeds.

"The scores in general agree quite favorably with the production of the animal," although "the score cards do not show the wide variation they should according to the records. . . . The measurements taken on the udder, milk veins, milk wells, chest, and barrel show that these parts are of as much importance with one breed as another, and for that reason the score cards should not differ as they do on these important points of conformation."

Hereditary traits in milch stock as revealed by Danish control unions, J. J. DUNNE (*Hoard's Dairyman*, 45 (1913), No. 26, pp. 856, 863, figs. 2).—An account of the practical results of the Danish control unions in improving milking strains in cows.

The formation of cow-testing associations, H. H. WING (*New York Cornell Sta. Circ.* 17, pp. 53-64, figs. 3).—In this circular the author notes the wide variation in the average yield of milk per cow in the different counties of New York and points out that "the counties containing the largest proportion of pure-breds include the counties in which the average yield was highest and the counties which made the largest increase in yield during the 10 years." He discusses the financial side of the dairy and points out the necessity for high-producing animals, value of records, and of the cow-testing associations, and the actual results of one testing association in New York State. Plans for the organization of testing associations are included.

Milking machines: Their sterilization and their efficiency in producing clean milk, LOIS W. WING (*New York Cornell Sta. Circ.* 18, pp. 65-74, figs. 3).—With a view of testing the efficiency of milking machines in producing a high grade of milk, and to determine the amount of care necessary in order to keep machines in a sterile condition, bacteriological counts were made of milk under different conditions.

Counts made on milk 30 minutes after coming from a machine which had been treated in brine solution were higher than the actual germ content of the cow's udder and indicated the existence of an external source of contamination. Counts of bacteria were then made of the brine used for sterilization, and these indicated a very high percentage of bacteria. Experiments were then conducted in the addition of hydrogen peroxid to the brine 1:10, of denatured alcohol to the brine 1:10, and of potassium permanganate. In these tests the bacteria count was lowered, but, because of the expense and special troubles, these agents were discarded. The results from the use of a solution of formaldehyde were excellent, but formalin was detected in the milk. Trials with vinegar, acetic acid, and copper sulphate proved unsatisfactory. The use of a salt solution containing chlorid of lime resulted in a marked reduction in the bacteria count and without any objectionable effect upon the milk.

A solution containing 0.1 per cent free chlorin proved satisfactory, although even a percentage as low as 0.01 showed efficient results. The use of a small amount of calcium peroxid showed some effect, but did not warrant the greater expense. Experiments with solutions containing different degrees of chlorin strength indicated the extreme germicidal action of this agent when sufficiently strong. The percentage of chlorin in the solution decreases after 24 hours' exposure, hence the necessity of frequently adding fresh chlorid of lime to the solution.

The effects of the administration of extracts of the pituitary body and corpus luteum to milch cows, W. GAVIN (*Quart. Jour. Expt. Physiol.*, 6 (1913), No. 1, pp. 13-16; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 606, I, p. 421).—The administration to dairy cows of these glandular extracts did not prove to be of any economic value. The intravenous injection of pituitary extract did not increase the quantity of milk per diem nor change the quality of the milk.

Acidity of cow's milk, A. CHRÉTIEN (*Hyg. Viande et Lait*, 7 (1913), No. 5, pp. 244-257, fig. 1).—Normal milk was found to contain from 1.04 to 2 gm. of lactic acid per liter, while colostrum contained slightly less. The feeding of a liquid distillery residue did not materially affect the acidity of milk. The acid content evidently increased with length of lactation period. Milk from a tubercular udder showed a decrease in acidity, while that containing *Bacillus mastitidis*, *B. coli*, staphylococci, and streptococci showed a greater acid content than normal milk.

Observations on the fat globules in milk, W. F. COOPER, W. H. NUTTALL, and G. A. FREAK (*Jour. Agr. Sci. [England]*, 5 (1913), No. 3, pp. 331-356, figs. 6).—The fact that there exists such a wide variation in both quantity and quality in samples of butter from different creams leads to the question whether any function of the fat globules (size, number, etc.) influences this variation. In this paper the authors report their investigations on the variable factors which might affect the "churnability" of cream and continuing previous work (E. S. R., 25, p. 582).

Analyses were made to determine the nitrogen-containing constituents in the milk serum and to ascertain their influence on the churnability of cream. However, "no correlation could be found between these figures and those obtained with the churnability apparatus and the other determinations which were made; this is probably due to the large number of factors involved."

Tests were conducted to determine the optimum temperature for churning, fresh creams containing 30 and 25 per cent of fat being churned at 54, 58, and 62° F.

Tables are given showing the weight of butter obtained and the percentage of fat lost in the buttermilk for different breeds of dairy cattle. The results are platted in curves showing the percentage of fat converted into butter at the various temperatures. "The most definite conclusion which can be drawn from these experiments is that the percentage of fat in the cream has a very marked influence upon the percentage conversion of fat into butter."

The mean size of the fat globules contained in the milks from which the creams were obtained is given, but no correlation could be determined between the percentage conversion and size of globules. With regard to the limiting surface of the globules, the authors hold to the view that "constituents of the milk serum are adsorbed to the surface of the globule."

Feeding experiments were conducted to determine the effect upon the fat globules of high, low, and medium proteid feeds. The variations were very irregular, and the "only conclusion which can be drawn from these experiments is that the food has little or no influence on the size of the globules, if the 'ratio' is taken as the criterion."

It is noted that the mean sizes of the globules of the Jersey and Guernsey breeds were not found larger than the average, while those in the milk from grade Shorthorns are considerably larger than those of the Jersey or of other breeds. This is contrary to the general opinion, although other investigators report similar findings.

The enumeration and measurement of fat globules in milk, W. F. COOPER, W. H. NUTTALL, and G. A. FREAK (*Jour. Agr. Sci. [England]*, 5 (1913), No. 3, pp. 357-376, figs. 2).—In this treatise the authors give complete descriptions of 2 methods of determining the number and size of fat globules in milk.

The original Babcock method consists in filling glass capillaries with diluted milk and with the aid of an ocular micrometer determining the number of globules in a known volume. The flat cell method consists in making a photomicrograph of the milk contained in a Thomas-Zeiss Cell, the enumeration and measurement being carried out on a print. From the photograph the number

of globules and the diameter of each globule in a definite area may be determined, and from these figures may be calculated the mean diameter of the globules, the actual distribution of the fat in the various sizes of globules, and the percentage of fat in the milk.

Comparing the capillary tube and the flat cell methods, the authors contend that, because of the varying volumes of diluted milk, the former method necessitates the use of a variable factor in calculating the mean volume, while in the latter plan there is a constant volume of undiluted milk and hence a constant factor to be dealt with. Furthermore, the volume of milk actually examined in the latter method is approximately 10 times that measured in the capillary method. The use of photography also facilitates enumeration of globules, and while the photograph is taken immediately the enumeration may be made at leisure. There may also be a double enumeration, thus checking the results and discarding any doubtful values. However, the flat cell method necessitates expensive apparatus and the expenditure of somewhat more time.

Influence of temperature on the physical condition of milk fat, W. VAN DAM (*Chem. Weekbl.*, 9 (1912), No. 50, pp. 982-991).—A report of investigations on the influence of heat and cold on the physical condition of milk fat, in which it was found that the expansion and contraction is directly dependent upon the temperature.

Slime-forming bacteria, G. TROILI-PETERSSON (*Centbl. Bakt. [etc.]*, 2. Bt., 38 (1913), No. 1-6, pp. 1-8, pl. 1).—In this article the author ascribes slime-forming characters in milk to the presence of *Bacterium droseræ*, and describes the activities of this bacterium in cultures of dextrose, lactose, bouillon, etc.

Sterilizing milk by electricity (*Dairy*, 25 (1913), No. 295, p. 194).—An account of experiments under way at the University of Liverpool, tending to show that "by the use of a specially constructed electrical apparatus, not only can milk be sterilized without detriment to its nutritive value, but that the tubercle bacillus in milk can be destroyed." It is stated that milk sterilized by this process is rendered eminently fit for infants' use, and that its keeping qualities are very greatly improved.

Some weaknesses of the city inspection theory, D. H. STEFFENS (*Cream and Milk Plant Mo.*, 1 (1913), No. 10, pp. 1-6).—In a contest between a commercial milk company and a board of health as to results in obtaining a clean milk supply, the former reports a decrease in bacteria count of from several millions per cubic centimeter at the beginning of the test to 5,200 per cubic centimeter in a period of 90 days. It is claimed that the city inspection theory involves merely the improvement of the details of equipment, while the commercial milk concern could consider the larger problem of methods employed on the dairy farm.

Farm butter making, J. R. KEITHLEY (*U. S. Dept. Agr., Farmers' Bul.* 541, pp. 28, figs. 15).—This is a popular discussion of butter making on the farm, replacing Farmers' Bulletin 241, previously noted (*E. S. R.*, 17, p. 802).

VETERINARY MEDICINE.

Text-book of pharmacology for veterinarians, G. MÜLLER (*Lehrbuch der Pharmakologie für Tierärzte. Hanover* [1913], 2. ed., pp. 483, figs. 72; rev. in *Vet. Jour.*, 69 (1913), No. 457, pp. 345, 346).—This book has been written especially for German and Austrian veterinarians, and the pharmacopœia of both countries has been consulted in its compilation.

The extra pharmacopœia, W. H. MARTINDALE and W. W. WESTCOTT (*London*, 1912, 15. ed., rev. and enl., vols. 1, pp. XXXI+1114; 2, pp. VIII+370).—This,

the fifteenth edition of this publication, has been entirely revised and enlarged. Some of the nomenclature used is that employed in the eighth decennial revision of the United States Pharmacopœia.

Yearly report in regard to the progress made in veterinary medicine, edited by W. ELLENBERGER, W. SCHÜTZ, O. ZIETZSCHMANN, ET AL. (*Jahresber. Vet. Med.*, 32 (1912), pp. V+424).—This report is in continuation of that previously noted (E. S. R., 28, p. 278).

Report of the acting director of veterinary research (Union), late government veterinary bacteriologist, for the year 1911, A. THEILER (*Union So. Africa Dept. Agr. Rpt. 1910-11*, pp. 137-166, pls. 3).—Previously noted from another source (E. S. R., 26, p. 882).

An improved rapid method of producing precipitins and hemolysins, F. P. GAY and J. G. FITZGERALD (*Univ. Cal. Pubs., Path.*, 2 (1912), No. 8, pp. 77-82; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 54 (1912), No. 19, pp. 602, 603).—This article not only confirms the findings of Fornet and Müller^a in regard to the rapid preparation of precipitins, but also points out that if the injections are made in the blood stream instead of the abdominal cavity, hemolysins are also produced. In this way it is possible to produce within 7 to 8 days a very satisfactory hemolytic system for the complement fixation test.

Contribution to our knowledge of antibody formation during the preparation of mono- and polyvalent sera, especially calf dysentery coli immune sera, R. HINDERSSON (*Beitrag zur Kenntnis der Antikörperbildung bei der Herstellung mono- und polyvalenter Sera, speziell der Kälberruhrcoli-Immunsers.* Inaug. Diss., Tierärztl. Hochsch. Dresden, 1912, pp. 70, figs. 10; Meddel. K. Vet. og Landbohøjskoles Serumlab., 1912, No. 20, pp. 58, pls. 5; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 55 (1912), No. 6, pp. 185, 186).—The immunizing capacity of the various calf dysentery coli strains was found to be very variable. Some strains are very strong antibody producers, while others are very weak in this respect or do not produce antibodies at all. It seems more practicable when combating calf dysentery to prepare polyvalent sera, because the agglutination and complement fixation powers of such sera are not very much lower than the titer of the monovalent sera. Highly potent sera can be prepared by injecting the organisms into rabbits. Some of the sera were as high as 1:100,000 for the agglutination, and for the complement fixation 0.0002. Sheep immunized intravenously show only a slow antibody formation.

Studies in regard to the agglutination of the different strains of *Micrococcus melitensis*, L. NÈGRE and RAYNAUD (*Compt. Rend. Soc. Biol. [Paris]*, 72 (1912), No. 15, pp. 664, 665).—Varied results have been reported with different strains of *M. melitensis* and the agglutination reaction. When 5 strains were tested with sera from diseased and healthy subjects, in some cases a reaction was obtained with the sera of healthy subjects, but, on the other hand, great difficulty was often experienced in obtaining a positive reaction with the sera of diseased subjects. This the authors believe to be due to the fact that serum sometimes contains thermostable agglutinins. Nevertheless they believe the safest procedure to obtain a positive reaction is to inactivate the serum before using.

Melitensis and *paramelitensis*, L. NÈGRE and M. RAYNAUD (*Compt. Rend. Soc. Biol. [Paris]*, 72 (1912), No. 18, pp. 791-793; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 55 (1912), No. 12, p. 381).—The agglutination of 6 strains of the *Micrococcus melitensis* from various sources was studied.

Only 5 of these agglutinated in dilutions of 1:5,000. The sixth strain, which came from a patient in Tunis, did not react. Sera from rabbits were then pre-

^a Ztschr. Biol. Tech. u. Methodik, 1 (1908), No. 3, pp. 201-206, figs. 3.

pared with the 6 strains, and agglutination was again obtained with all but the Tunis strain. The name *M. paramelitensis* was suggested for the Tunis strain.

Identification of *Micrococcus paramelitensis* by saturation with agglutinins, L. NÈGRE and M. RAYNAUD (*Compt. Rend. Soc. Biol. [Paris]*, 72 (1912), No. 24, pp. 1052-1054; *abs. in Centbl. Bakt. [etc.]*, 1. *Abt., Ref.*, 55 (1912), No. 12, p. 382).—The Tunis strain mentioned in the abstract above was reexamined as regards agglutination. The results show that the strain will only partly combine with the agglutinins of a serum prepared from a strain giving normal agglutinins. From a serum made with *M. paramelitensis* it will act in a reverse manner when tested against a *melitensis* strain.

Algerian sheep and anthrax, A. LHÉRITIER, A. FLEURY, and A. TRIBOUT (*Bul. Soc. Path. Exot.* (1912), No. 6, pp. 336-339; *abs. in Centbl. Bakt. [etc.]*, 1. *Abt., Ref.*, 55 (1912), No. 6, p. 161).—During an epidemic of anthrax, principally among bovines in Algeria, a sheep became infected and died. From this animal a strain was isolated which was very virulent for sheep and produced fatal results in other animals 2 to 4 days postinfection. A strain of the *Bacillus anthracis* obtained from France was not fatal for Algerian sheep.

Foot-and-mouth-disease, J. MCFADYEAN (*Jour. Roy. Agr. Soc. England*, 73 (1912), pp. 90-103, figs. 5).—This paper presents a historical account of the disease in Great Britain, the cause of the disease, susceptibility and method of infection, course of the disease and symptoms, and diagnosis.

Nuttallia and Piroplasma in piroplasmosis of solipeds in Transcaucasia, E. DSCHUNKOWSKY and T. LUHS (*Parasitology*, 5 (1913), No. 4, pp. 289-302, pls. 2; *abs. in Trop. Vet. Bul.*, 1 (1913), No. 4, pp. 199-201).—This paper summarizes all the cases of piroplasmosis that have been observed by the authors in solipeds. They conclude that 2 species of parasites are concerned, namely, *Nuttallia* and *Piroplasma*.

The recent campaign against rinderpest on the island of Panay, C. G. THOMSON (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 5, pp. 236-242, fig. 1).—A brief description of the work carried on.

Tuberculosis A. BALFOUR, R. G. ARCHIBALD, ET AL. (*Rpt. Wellcome Research Labs. Gordon Mem. Col. Khartoum*, 4 (1911), Sup., pp. 378-387).—This is a comprehensive review of the recent literature in regard to tuberculosis.

A contribution to the spore question and staining of spores of the tubercle bacillus, A. KIRCHENSTEIN (*Centbl. Bakt. [etc.]*, 1. *Abt., Orig.*, 66 (1912), No. 1, pp. 144-159, figs. 2; *abs. in Internat. Centbl. Gesam. Tuberkulose Forsch.*, 7 (1913), No. 5, p. 267).—The grains, slivers, granules, etc., are actual spores which are not so resistant toward heat or chemicals as are the spores of other organisms. They are, however, more resistant toward the agents mentioned than the bacteria themselves, and are capable of germinating.

Investigations in regard to the amount of tubercle bacilli in the bile of tubercular animals, E. JOEST and E. EMSHOFF (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 10 (1911), No. 4, pp. 197-206; *abs. in Centbl. Bakt. [etc.]*, 1. *Abt., Ref.*, 52 (1912), No. 1-2, p. 20).—The bile of 57 animals, namely, 26 bovines and 31 pigs, the majority of which were affected with generalized tuberculosis, was injected into guinea pigs for the purpose of testing whether the bile was virulent. In 14 cases (6 bovines and 8 pigs), tubercle bacilli were detected in the bile, and in 4 of these cases tubercle bacilli could be detected by direct microscopic examination. No tuberculosis of the mucous membrane of the gall bladder was noted.

Investigations in regard to the type of tubercle bacilli which occurs in the sputum of man, WEBER and DIETERLEN (*Tuberkulose Arb. K. Gsndhtsamt.*, 1912, No. 12, pp. 1-10; *abs. in Centbl. Bakt. [etc.]*, 1. *Abt., Ref.*, 55 (1912), No. 1,

pp. 9-11).—This deals with the examination of 10 patients who were kept constantly under observation and examined according to Koch's directions. All were infected with the human type of bacillus. The antiformin method was found very useful for detecting the tubercle bacillus microscopically and for the direct cultivation from the sputum. The antiformin does not affect the human or bovine type (obtained from tracheal secretions of a tubercular cow) of bacillus.

Human tubercle bacilli in the milk of a vaccinated cow, A. S. GRIFFITH (*Jour. Path. and Bact.*, 17 (1913), No. 3, pp. 323-328).—Much of this material has been noted from another source (E. S. R., 26, p. 777).

In addition it has been observed that a heifer, vaccinated against tuberculosis when 4 days old with human tubercle bacilli, was discharging tubercle bacilli which were virulent for guinea pigs. "A complete post-mortem examination was not possible, as the heifer was killed in the open field. Nothing of an obviously tuberculous nature was found in the udder or in the supramammary lymphatic glands; the mucous membrane of the milk sinuses and ducts was normal, and the milk within them was also normal in appearance. A minute gray tubercle was seen in the lungs, but otherwise they appeared perfectly normal. The thoracic lymphatic glands were normal, and the liver and the spleen and the serous membranes showed no sign of tuberculosis. The heifer had reacted to the tuberculin test on 3 separate occasions, namely, 7, 12, and 28 months after the protective inoculation."

The danger to public health from this source is pointed out.

Tubercular antigens and antibodies, A. CALMETTE and L. MASSOL (*Compt. Rend. Soc. Biol. [Paris]*, 73 (1912), No. 26, pp. 120-122; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 55 (1912), No. 1, p. 21).—Three kinds of antigens are present in tuberculosis, an exobacillary antigen which goes over into the nutrient medium and can be obtained from Koch's tuberculin by dialysis, and 2 endobacillary antigens, one of which is soluble in water. With the 3 antigens 134 sera from tubercular subjects were examined, and in 92.49 per cent of the cases complement fixation was obtained. The sera behave differently toward the various antigens so that a differentiation of the sera is possible.

The differentiation of active and inactive tuberculosis in bovines with the complement fixation, meiostagmin, and ophthalmic reactions, S. WYSCHESLSKY (*Ztschr. Tuberkulose*, 19 (1912), No. 3, pp. 209-237; *abs. in Internat. Centbl. Gesam. Tuberkulose Forsch.*, 7 (1913), No. 5, p. 280).—When phymatin was used as the antigen in the complement fixation test, it was found practically as efficient as a solution of tubercle bacilli in lactic acid, or as an emulsion of tubercle bacilli. The meiostagmin reaction gave unsatisfactory results. Bovines strongly tubercular do not give the ophthalmic reaction with dilute phymatin, and often show the presence of a large amount of antibodies with the complement fixation method against phymatin.

Comparative investigations of the ophthalmic, thermal, and intracutaneous tuberculin tests, the complement fixation reaction, and the cobra venom hemolysis according to Calmette, with particular reference to the specificity of the tuberculin test, especially the eye test, W. ASSMANN (*Vergleichende Untersuchungen über die Ophthalmoreaktion, thermische Tuberkulinprobe, Intrakutanreaktion, das Komplementbindungsverfahren, und die Kobragifthämolyse nach Calmette, mit besonderer Berücksichtigung der Spezifität der Tuberkulinreaktion namentlich bei der Augenprobe. Inaug. Diss., Univ. Bern, 1910, pp. 104*).—Continuing previous work (E. S. R., 26, pp. 379, 584) the ophthalmic reaction gave better results with tubercular animals than the thermal and intracutaneous reactions, showing positive in 100 per cent. The

thermal reaction showed positive in 71.4 and questionable in 7.1 per cent; and the intracutaneous positive in 76.7, and questionable or negative in 23.3 per cent.

Protective vaccination tests against tuberculosis according to Klimmer's method, T. KRAUTSTRUNK (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 10 (1911), No. 4, pp. 274-287; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 52 (1912), No. 1-2, p. 45).—Of 4 bovines, which did not react toward tuberculin when treated intravenously with 1.2 mg. of bovine tubercle bacilli, 2 were given Klimmer's antiphymatol and 2 were kept as controls. The controls died, while the animals vaccinated with antiphymatol showed on autopsy widely disseminated tubercular lesions. The results of the vaccination could not be considered an immunity, but simply an increased resistance toward the disease.

Two other animals were treated by Klimmer's method, and with 2 nonreacting animals placed in an inclosure for 69 days with a cow having open tuberculosis. On slaughtering the animals no appreciable difference in the pathologic process was noted between the animals vaccinated and those not vaccinated.

Some remarks in regard to the protective vaccination tests of Krautstrunk, M. KLIMMER (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 10 (1911), No. 4, pp. 375-379; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 52 (1912), No. 1-2, p. 45).—A short critical discussion of the findings noted in the abstract above.

The transmission of anaplasmosis by means of ticks, A. THEILER (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 12 (1912), No. 2, pp. 105-116; *abs. in Trop. Vet. Bul.*, 1 (1913), No. 2, pp. 64-69).—"Five imported English animals and one stall-born Africander calf were used for the experimental transmission of *Anaplasma* by means of ticks. All the animals were susceptible to the disease. Two of the English animals were immune to redwater, the immunity having been conferred experimentally before exportation.

"Anaplasmosis was transmitted in every case. In the first experiment both anaplasmosis and babesiasis were transmitted by means of larval blue ticks derived from females engorged on animals immune to redwater and anaplasmosis. In the second experiment the ticks transmitted anaplasmosis to animals immune to redwater. In the third experiment the ticks used were originally obtained from horses, and were proved to be entirely free from infection. These ticks were infected by placing them on an animal which had passed through anaplasmosis and *mutans* babesiasis. Only the *Anaplasma* infection was transmitted, as shown by subsequent inoculations of the English animals with blood. In the fourth experiment it was incidentally proved that the larvæ of *Rhipicephalus simus* are capable of transmitting a pure *Anaplasma* infection. All the animals which passed through an attack of pure anaplasmosis remained susceptible to infection with *Babesia bigemina*.

"It must be considered as proved that *Anaplasma* can be transmitted by means of ticks either by itself or together with *B. bigemina* and *Spirochæta theileri*. This proves that anaplasmosis and babesiasis are independent conditions. Reference must be made to the comparatively long period of incubation after tick infestation. Full use was made of this fact in the protective inoculation against anaplasmosis (*A. marginale centrale* against *A. marginale* infection)."

Further observations regarding the transmission of East Coast fever by means of ticks, A. THEILER (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 12 (1912), No. 1, pp. 26-42; *abs. in Trop. Vet. Bul.*, 1 (1913), No. 2, pp. 71-76).—"Brown adults which were infected as larvæ, and which transmitted the disease as nymphs, are not infective for susceptible animals. Three different broods of ticks were used. In the nymph stage they transmitted the disease to 8 animals, but in the adult stage failed to transmit it to 2 susceptible animals.

Ticks belonging to the same broods which had reached the nymph stage on animals experimentally immunized against East Coast fever failed to transmit the disease in 6 cases in the adult stage. This proves that brown ticks which become infected in one stage are cleansed in the following stage whether they engorged themselves on immune or susceptible animals. Ticks infected as larvæ which passed the nymphal stage on a rabbit were not infective for susceptible animals as adults. This confirms the foregoing fact that a tick loses its infection the first time it engorges on a susceptible or immune animal. Clean or infected ticks which engorge on a recovered (immune) animal do not transmit the disease in their next stage. This conclusion was arrived at 8 years ago [E. S. R., 17, p. 591].

"It has been shown that different broods of ticks which were collected at the same time and kept under the same conditions do not transmit the disease during the next stage even when placed upon animals in large numbers. Other broods kept under the same conditions and collected in the same way infect a few animals only, while still others prove to be infective on every occasion, and even when used in small numbers only. It is difficult to explain this fact but it is quite possible that external circumstances have an influence in some way or other. Those ticks which failed to transmit the disease were fed during the coldest periods of the year. This is possibly the explanation of the fact that the disease in the field is relatively less severe during the winter months; but the fact should not be lost sight of that at this period of the year the ticks are not particularly active."

Tick bite in British Columbia, J. L. TODD (*Jour. Trop. Med. and Hyg.* [London], 16 (1913), No. 4, pp. 58, 59).—This article relates to reports of cases in which infection of the wound caused by *Dermacentor venustus* had been followed by local inflammation that was sometimes very severe; also of several cases in which the bites of ticks have been followed by paralysis and sometimes by death. The symptoms reported in these cases are said to be quite unlike those that occur in Rocky Mountain spotted fever.

The biology or life history of the cattle tick as determined at Auburn, Ala., H. W. GRAYBILL and W. M. LEWALLEN (*Alabama Col. Sta. Bul.* 171, pp. 75-96).—The data here presented relating to the studies of the biology of the cattle tick carried on at Auburn, Ala., during the years 1907 to 1909 have largely been previously noted from another source (E. S. R., 25, p. 564).

Dipping vats and dips, C. A. CARY (*Alabama Col. Sta. Bul.* 171, pp. 97-110, figs. 3).—The author gives directions and plans for the construction of dipping vats, directions for the use of the arsenical dip and of oil emulsion, with instructions for the taking up of the work of tick eradication. The regulations governing shipment of live stock into Alabama are appended.

Inquiry into dips and dipping in Natal, A. THEILER and C. E. GRAY (*Agr. Jour. Union So. Africa*, 4 (1912), No. 6, pp. 814-829; 5 (1913), Nos. 1, pp. 51-67, figs. 9; 2, pp. 249-263).—This article discusses at length the proper site and construction of dipping tanks, including scale drawings. The effects of dips upon animals are dealt with and practical advice given as to dipping various animals, the question of cost being considered.

In discussing the extent of tick infestation, it is stated that the area involved was 1,144 square miles, or about one-eighteenth of the area of Natal. In some instances the absence of ticks is thought to be due to the presence of the red-beaked tick bird.

Oxidation of the arsenite of soda in dipping tanks, C. WILLIAMS (*Agr. Jour. Union So. Africa*, 5 (1913), No. 1, pp. 68-74).—After summarizing the investigational work hitherto published on the subject, the author reports in detail

the results of experiments carried on in the laboratory at Cedara during a period of 6 months.

It was found that no oxidation whatever of the arsenite took place in a dip fluid made up of sodium arsenite in pure water but that the addition of excretory matter caused such rapid oxidation that within 2 months practically all the arsenite had disappeared. It is shown that oxidation is far more rapid during the warmer summer months of the year, owing to the greater activity of the bacteria at the higher temperatures.

The toxic properties of arsenite and arsenate of soda, J. MULLER (*Agr. Jour. Union So. Africa*, 5 (1913), No. 5, pp. 714-716).—In the investigations frogs were not affected by water in a pool found to contain 5 grains of arsenite of soda per gallon, drinking from which had caused the death of a number of calves. In 3 experiments conducted frogs placed in water containing 3.7 grains of arsenate of soda, 4.1 grains of arsenate of soda, and 8 grains of arsenate of soda, respectively, per gallon of liquid and allowed to swim died in 4 hours, 7 days, and 8 hours, respectively.

The reported hosts of *Cysticercus cellulose*, B. H. RANSOM (*Science*, n. ser., 37 (1913), No. 954, pp. 577, 578).—It is pointed out that the only hosts in which the occurrence of *C. cellulose* can be considered to have been proved are the pig, its usual host; man, as a result of auto-infection; and the dog.

About the diagnostic value of the complement fixation test and the ophthalmic reaction in the diagnosis of infectious abortion in cows, P. HANTSCHÉ (*Über den diagnostischen Wert der Komplementbindung und der Ophthalmoreaktion beim infektiösen Abortus der Kühe*. Inaug. Diss., Tierärztl. Hochsch. Dresden, 1912, pp. 47, pls. 2; abs. in *Centbl. Bakt.* [etc.], 1. Abt., Ref., 55 (1912), No. 6, pp. 182, 183).—Of the 255 animals examined, 225 originated from infected barns and 30 from barns apparently having no diseased animals in them. The sera of the last-named animals in no case produced a total fixation of complement when 0.1 cc. was employed. This value, 0.1 cc., is set down as a limiting standard for distinguishing between diseased and sound animals.

Of 36 animals which were suspected clinically, i. e., animals in which an abortion or premature birth had previously occurred, 33 gave a positive reaction and 3 a negative reaction. In 1 case the complement fixing substances were absent 1½ months after the premature births, but the agglutinins were still present. The remaining 189 animals (156 cows, 22 heifers, and 11 bulls), in which clinical symptoms were not present and which came from barns containing diseased animals, gave a positive reaction.

The ophthalmic reaction was obtained with only 52 per cent of the animals which were positively diseased. Forty-four animals which were suspected but which had not previously aborted, showed positive in 47.7 per cent of cases. One hundred animals which did not abort or give a positive serological test, but which came from an infected barn, reacted positively in 26 per cent of cases. Of 25 animals which were without doubt nonaborters 12 per cent gave a positive reaction.

About the diagnostic value of the agglutination and intracutaneous reactions for diagnosing infectious abortion in cows, W. SCHULZ (*Über den diagnostischen Wert der Agglutination und der Intrakutanreaktion beim infektiösen Abortus der Kühe*. Inaug. Diss., Tierärztl. Hochsch. Dresden, 1912, pp. 43; abs. in *Centbl. Bakt.* [etc.], 1. Abt., Ref., 55 (1912), No. 6, pp. 183, 184).—In this work the sera of 153 bovines were tested. For the agglutination test a reaction obtained with a dilution of 1:50 or greater is considered positive. Utilizing this limit, 30 animals were found to be free from the disease. The sera from 24 animals clinically diseased showed positive in 22

instances. The sera of 99 animals, which had been kept in infected barns but had not given premature births or aborted, showed positive in 28 cases.

For the intracutaneous reaction 2 preparations were used. These were prepared by concentrating 5 to 6-week-old bouillon cultures of the *Bacillus abortus* to one-tenth of the volume. For the test 0.2 cc. was taken, and an apparatus called the "cutimeter" was used for measuring the swelling produced. A reaction was considered positive when the difference between the normal and swollen skin amounted to 5 mm. Of 30 nonaborting animals, 1 showed positive with the test, and with 22 aborting bovines 19 or 20 gave a positive reaction. Among 23 animals which were suspected of being aborters, from 13 to 15 gave positive reactions. Of 53 other animals probably free from the disease 17 gave positive reactions.

Chronic diarrhea in cattle.—Johne's disease, B. H. MELLON and P. MACGINNIS (*Dept. Agr. and Tech. Inst. Ireland Jour.*, 13 (1913), No. 2, pp. 311-324).—The investigation here reported failed to develop a remedy for this disease.

Concerning the specificity of ultramicroscopic bodies in contagious pleuropneumonia in cattle, G. FREIBERGER (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 12 (1912), No. 5, pp. 455-461).—The author's studies led to the conclusion that the ultramicroscopic bodies described by certain investigators as the cause of contagious pleuro-pneumonia are not specific since similar bodies are also found in the blood of healthy and diseased men, cattle, and horses.

Worms in sheep.—Some experiments in treatment, M. HENRY (*Agr. Gaz. N. S. Wales*, 24 (1913), No. 2, pp. 116-122).—In drenching experiments in 1910 and 1912 with worm-infested lambs in which arsenic, copper sulphate, a proprietary drench, and creosote were used, the controls did best with the exception of one lot of lambs treated with arsenic and magnesium sulphate. In other experiments, sheep that were supplied with a lick of calcium phosphate 5 parts, sulphate of iron 1 part, and Liverpool salt 40 parts gained much faster in weight during a 3 months' test than did a lot supplied with a similar lick without the calcium phosphate.

Forage poisoning or cerebro-spinal meningitis, J. R. MOHLER (*Amer. Vet. Rev.*, 42 (1913), No. 5, pp. 506-522).—This paper has been previously noted from another source (*E. S. R.*, 28, p. 886).

Investigations of the clinical appearance of enzootic cerebrospinal meningitis (Borna disease) of the horse with an account of therapeutic experiments, J. SCHMIDT (*Berlin. Tierärztl. Wchnschr.*, 28 (1912), Nos. 32, pp. 581-586; 33, pp. 597-603; *abs. in Cornell Vet.*, 3 (1913), No. 1, pp. 27-33).—This report of investigations carried on since 1907 includes a detailed account of the clinical symptoms of the disease, as based upon a study of 415 cases.

The course run in a large percentage of the cases was from 1 to 2 weeks. Recovery was complete in 6.3 per cent and incomplete in 3.6 per cent of the cases. The symptoms indicate the presence of disease foci in the essential substance of the cerebrum, cerebellum, medulla oblongata, and the spinal cord, as well as in the cortex of the large brain.

Therapeutic experiments gave only negative results.

A report on the outbreak of cerebrospinal meningitis (encephalitis) in horses in Kansas and Nebraska in 1912, D. H. UDALL (*Cornell Vet.*, 3 (1913), No. 1, pp. 17-43, pls. 5).—The author first reviews at some length reports of investigations relating to the subject. This is followed by a report of the clinical experience of the author and others during the outbreak in Kansas, Nebraska, and neighboring States in 1912.

The author concludes that the evidence does not indicate that the disease is due to food poisoning or that the food or water is an essential carrier of the toxic or infective agent. See also a previous note (E. S. R., 28, p. 886).

Parasitic mange in horses, asses, and mules (*Bd. Agr. and Fisheries [London], Leaflet 274, 1913, pp. 5*).—A popular account.

The cultivation of the fowl spirochete, V. DANULESCO (*Compt. Rend. Soc. Biol. [Paris], 74 (1913), No. 8, pp. 369-371; abs. in Trop. Vet. Bul., 1 (1913), No. 4, p. 236*).—The author has successfully applied the method described by Noguchi (E. S. R., 28, p. 282) to the cultivation of *Spirochæta gallinarum*. Five generations were obtained by using cultures from 4 to 7 days old for the subcultures.

Serotherapy and protective vaccination in fowl spirochetosis, H. DE B. ARAGÃO (*Mem. Inst. Oswaldo Cruz, 3 (1911), No. 1, pp. 3-39; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 53 (1912), No. 12, pp. 380, 381*).—A description of a serotherapeutic method against this disease. In order to paralyze the cytotoxins produced as a result of injecting the cellular material of the parasite, antibody formation is stimulated against these substances. The procedure is described in detail in the original article.

It was also possible to vaccinate against this disease with defibrinated blood containing spirochetes sterilized with formaldehyde vapor. One cc. of the vaccine was found to confer a good and lasting immunity. A good vaccine can also be prepared with glycerin. There is thought to be no reason why the method described can not be applied to other diseases, as tick fever, etc.

RURAL ENGINEERING.

Irrigation resources of California and their utilization, F. ADAMS (*U. S. Dept. Agr., Office Expt. Stas. Bul. 254, pp. 95, pls. 17*).—This report is a summary of reports prepared in cooperation with the Conservation Commission of the State of California and other state agencies as follows: Irrigation resources of northern, central, and southern California, by Frank Adams, S. T. Harding, R. D. Robertson, and C. E. Tait, respectively; and the use of water in 1912 for irrigation in Shasta Valley, by N. M. Stover; from Feather River, by R. V. Meikle; from east side tributaries of San Joaquin River, by J. T. Kingdon; from San Joaquin River, by Harry Barnes; in Santa Clara Valley, by R. L. Egenhof; from Santa Clara River, by J. N. Irving; and in the Valley of Santa Ana River, by A. J. Salisbury, jr.

A summary of reports on the irrigation resources of California shows that the total area of irrigable agricultural land found in the zones of irrigation water supplies is 21,865,200 acres, of which 3,192,646 acres are already irrigated and 9,699,600 acres are estimated as the area to be ultimately irrigated. Northern California contains about 28.5 per cent of the total irrigable area, about 15 per cent of the total irrigated area, and about 35.5 per cent of the area it is estimated may ultimately be irrigated; the corresponding figures for central California being 44, 61, and 44.5 per cent, and for southern California 27.5, 24, and 20 per cent.

The mean annual flow of the major surface streams of California in round numbers approaches 60,000,000 acre-feet. The detailed studies of the use of water in 1912 in the typical sections show approximately the general duties now obtained in California with irrigation water. In Little Shasta Valley as much as 4 or 5 acre-feet per acre was about the average diversion between April and August, inclusive. On the Feather River the average diversion by the largest gravity canal was 7.53 acre-feet per acre from May through October, while the averages for the 2 systems next smaller were 6.06 and 5.83 acre-feet per acre,

respectively. On the other hand, the quantities actually used on 9 typical farms varied from 0.75 acre-foot per acre on a sandy loam prune orchard, for which the water supply was pumped, to 2.72 acre-feet per acre on a clay loam alfalfa field, not counting a 50-acre rice field on which 5 acre-feet per acre were used.

On the east-side tributaries of the San Joaquin the diversions per acre by about 20 systems ranged from 1.50 acre-feet, by ditches supplying water mostly to vineyards, to 12.45 acre-feet by the largest canal. On the main San Joaquin the range of averages was from 0.5 acre-foot under one of the largest pumping plants to 3.08 acre-feet used during high water under a canal irrigating 8,000 acres of pasture. Under the main west-side canal from San Joaquin River the average diversion per acre was 2.75 acre-feet, while the actual use on 31 typical tracts ranged from 0.85 acre-foot per acre on an alfalfa field of heavy soil to 3.88 acre-feet on an alfalfa field of sandy soil. In Santa Clara Valley the diversions from surface streams varied irregularly from 2.30 to 4.39 acre-feet per acre. The average diversions per acre in 1912 in the Santa Clara River Valley from April to October, inclusive, ranged from 0.76 acre-foot under a ditch watering 1,400 acres of citrus and deciduous fruits to 15.10 acre-feet under a small ditch watering 40 acres of alfalfa. Net figures of actual use on typical farms along this river showed depths applied ranging from 0.46 acre-foot on beans to 2.74 acre-feet on lemons and 6.21 acre-feet on alfalfa. Along Santa Ana River the diversions varied between January and November, 1912, from 1.31 to 2.96 acre-feet per acre under systems irrigating citrus fruits, alfalfa, and miscellaneous crops, and from 2.04 to 6.45 acre-feet per acre where alfalfa was the main crop watered. Nine individual farms under Santa Ana systems gave duties ranging from 1.52 to 4.10 acre-feet per acre for oranges, from 3.18 to 4.83 acre-feet per acre for walnuts, and from 4.38 to 4.45 acre-feet per acre for alfalfa.

Several irrigation maps accompany this report.

Meadow farming in the land of the Sieg [Siegerland], A. HEINEMANN (*Der Wiesenbau im Siegerlande. Berlin, 1913, pp. 65, pls. 24, figs. 21*).—This book deals with grass farming in Siegerland and discusses the various methods employed in the development of meadow land by means of fertilization and irrigation. Methods of storing and utilizing water for irrigation from various sources are illustrated and described, and the various laws and ordinances governing the use of water and the local popular rules and regulations for fertilizing and irrigating are given and discussed. Fourteen plates are given representing various forms of meadow irrigation, and 10 plates showing various small irrigation structures employed, such as head gates, floodgates, weirs, small dams, overflow dams, and dam spillways.

The right drain for the right place, E. R. JONES (*Wisconsin Sta. Bul. 229, pp. 3-50, figs. 28*).—It is estimated that during certain periods of the year an excess of water is damaging over 7,000,000 acres of Wisconsin lands, of which one-third consists of muck and peat marshes and the other two-thirds mostly of wet clays. A discussion of the detrimental effects of an excess of water on such soils is followed by descriptions of the various common methods of land drainage, including surface drainage by open ditches, tile underdrains, stream straightening, vertical drains, and drainage by pumping. Lands needing drainage are classified according to the increasing benefits derived therefrom and typical drainage projects, both farm and district organization projects, are described, showing the nature of the areas, the details of the drainage system, and the specific results of drainage.

In a discussion of the planning and constructing of the farm drainage system it is stated that the farmer should study the conditions causing poor drainage on his land and the best remedy for them. Methods of staking out and estab-

lishing the grade lines of a farm drainage system are described, and it is suggested that a surveyor be employed to test the final survey.

A simple and economical method of burning lime, J. H. ARNOLD and J. E. NICHOLS (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 130, pp. 19-23, figs. 3*).—This paper gives the results of lime-burning experiments on a farm in Warren County, Kentucky. The kiln was located on top of a bed of limestone, the greater part of which was exposed at or very near the surface. Poles and slabs were placed lengthwise on the ground, making a layer 30 ft. long and 16 ft. wide. The largest poles, 8 or 10 in. in diameter, were used for the outside rows in order to make a more stable foundation. The smaller poles and slabs were placed between the large outside poles, and these made up the layer except for a strip 2 ft. wide in the middle, where smaller wood and kindling were placed the entire length of the kiln. Chinks between the poles and slabs were filled with fine wood and cornstalks. Fine coal was then placed as a second layer to a depth of 2 in. On the top of it was placed a 4 or 5 in. layer of crushed limestone on which another layer of coal was added, this being followed by a 12 to 14 in. layer of limestone. Alternate layers of coal and stone were then added to these until the pile was 7 or 8 ft. high and was then shaped off into a pyramid. The fire was started on the windward end near the middle, and the burning continued about two weeks. The dirt was then removed to allow the rains to slake the lime. The total cost of burning the 87 tons of lime in this kiln was \$80.10. On a similar kiln of the same dimensions the total cost was \$93.

Progress reports of experiments in dust prevention and road preservation, 1912 (*U. S. Dept. Agr., Office Pub. Roads Circ. 99, pp. 51*).—The completed experiments as begun in 1911 at Chevy Chase, Md. (*E. S. R., 28, p. 383*), of treating the surface of a waterbound macadam road with bitumens are as follows: A section comprising 1,477 sq. yds. was cold-treated with 0.54 gal. per square yard of refined water-gas tar preparation on which was spread $\frac{1}{2}$ to 1 in. limestone chips at the rate of 0.014 cu. yd. per square yard. A section comprising 761 sq. yds. was cold-treated with 0.53 gal. of asphaltic petroleum per square yard. After 6 hours this was covered with $\frac{1}{2}$ to 1 in. limestone chips at the rate of 1 cu. yd. for every 72 sq. yds. A section comprising 1,013 sq. yds. was treated with hot residual petroleum under 60 lbs. pressure, which was immediately covered with screenings. The total cost per square yard for these treatments were, respectively, 7.01, 9.43, and 11.73 cts. An inspection of these surfaces in February, 1913, showed them to be in fair condition, yet with some wear which will require additional treatment. A section comprising 388 sq. yds. of the same surface was resurfaced with native asphalt emulsion and fine trap screenings mixed, containing $10\frac{1}{2}$ gal. emulsion to 4 cu. ft. of screenings. This was applied to a thickness of $2\frac{1}{2}$ in. at a total cost per square yard of 81.51 cts., including rolling and preparing the old surface.

In 1912 experiments at Chevy Chase, Md., in which sections of bituminous, cement, and oil-cement concrete were constructed, were as follows: A section comprising 1,498 sq. yds. was constructed of bituminous concrete (Topeka specifications), the surface layer being laid upon a 6 in. cement concrete foundation of a 1:3:7 mixture. The bituminous concrete layer was laid on the base after 1 month to a thickness of 2 in. after rolling and finished by a light covering of Portland cement. Two mixtures of bituminous concrete were used, the first consisting of 7.6 cu. ft. of limestone screenings to 8.8 gal. of asphalt cement and 50 to 70 lbs. of limestone dust; and the second consisting of 8 cu. ft. of trap-rock screenings to 9.3 gal. of asphaltic cement and 60 lbs. of limestone dust. A section of bituminous concrete (District of Columbia specifications) comprising 1,400 sq. yds. was laid in the same manner, using 2 bituminous concrete mixtures, the first consisting of 7.6 cu. ft. of crushed limestone to 4 cu. ft. of

sand to 60 lbs. limestone dust and 9.3 gal. of asphaltic cement, and the second consisting of 7.6 cu. ft. of crushed trap rock, 4 cu. ft. of sand, 50 lbs. of limestone dust, and 8.2 gal. of asphaltic cement.

A cement concrete section, comprising 2,837 sq. yds., was constructed of a 1:1 $\frac{1}{4}$:3 mixture, using coarse aggregates of $\frac{1}{4}$ in. to 1 $\frac{1}{2}$ in. gravel and $\frac{1}{4}$ in. to 1 $\frac{1}{2}$ in. crushed limestone. The proposed bituminous coating for this pavement was omitted on account of cold weather. A similar section, comprising 2,011 sq. yds., was also undertaken.

A section of oil-cement concrete, comprising 2,430 sq. yds., was constructed using the same proportions and coarse aggregates as in the cement concrete. Five pints of light residual petroleum per bag of cement were mixed with the concrete. These surfaces when inspected in March, 1913, were in excellent condition. In connection with these experiments observations are being taken on the change in length of the concrete due to temperature and moisture changes. The measurements are taken by means of a specially designed 10-ft. strain gage on brass plugs embedded in the concrete.

At Washington, D. C., the surfaces of several sections of limestone macadam were treated with tar preparations and oils for the purpose of obtaining comparative data on several well-known bituminous materials adapted to cold surface treatment. In June, 1912, these surfaces were treated with the molasses-lime mixture previously noted at a cost of 2 cts. per square yard. This treatment was unsuccessful, and in October, 1912, the surfaces were treated in 4 sections with refined water-gas tar preparation, asphaltic petroleum, residual petroleum, and asphaltic petroleum under 60 to 75 lbs. pressure at respective costs per square yard of 6.997, 7.574, 8.936, and 5.672 cts. When inspected in March, 1913, all of these sections presented a satisfactory appearance.

Supplemental reports are appended of experiments made at Chevy Chase, Md., in 1911 on the use of tars and native and oil-asphalt preparations and on the use of refined semiasphaltic oil; at Jamaica, N. Y., 1911, on the use of oil-cement concrete, oil asphalt, tar, and fluxed native asphalt; at Ithaca, N. Y., 1909, 1910, and 1911, on the use of tar, oil, oil asphalt, brick, cement, and slag; at New York, N. Y., and Ridgewood, N. J., 1910, on the use of oil-cement concrete; at Boise, Idaho, 1910, on oil-gravel macadam; at Ames, Iowa, 1910, on the use of oil-asphalt gravel; at Knoxville, Tenn., 1910, on the use of tar and oil preparations; at Youngstown, Ohio, 1909, on the use of slag, slag and lime, slag and waste sulphite liquor preparation, and slag and tar; at Newton, Mass., 1908, on the use of asphaltic preparations, tar preparations, residual oil, and molasses-oil-lime; at Garden City, Dodge City, Bucklin, Ford, and Independence, Kans., 1908, on sand clay and oil asphalt earth roads; and at Bowling Green, Ky., 1907, on the use of Kentucky rock asphalt.

Rock asphalts of Oklahoma and their use in paving, L. C. SNIDER (*Okla. Geol. Survey Circ. 5, 1913, pp. 22, figs. 7*).—Attention is called to the extent of rock asphalts in Oklahoma which with 1 or 2 exceptions occur in the southern one-third of the State. The asphalt-bearing rocks are sandstone and limestone impregnated with bituminous materials in varying percentages. The results of tests of the properties of these materials, as made by the Office of Public Roads of this Department, are given in tabular form.

In spite of the abundant supply of raw material the Oklahoma asphalts have not been used to any great extent for paving purposes, due largely to the prevailing belief that they are not suited for paving. A comparison of the analyses of sheet-asphalt samples and rock-asphalt samples show that the rock-asphalt pavement has a lower but far more uniform bitumen in content and composition, although the average composition of the bitumen is about the same. The construction of rock-asphalt pavements is described, and from

the results of comparative service tests of these and other asphalt pavements it is stated that although the percentage of bitumen in the Oklahoma rock asphalt is less than that in the sheet asphalt it is as great as that of the rock-asphalt pavements of Europe, which have given satisfaction for years.

It is concluded that pavements constructed of Oklahoma asphalts are successful and that these asphalts are worthy of consideration as a paving material.

A new 2-cycle internal-combustion engine, G. LECOINTRE (*Bul. Soc. Agr. France, 1913, May 15, Sup., pp. 678-680, fig. 1*).—A 2-cylinder, 2-cycle internal-combustion engine is described in which the charge of gas for each cylinder is supplied by the compression stroke of the piston in the other cylinder, thus avoiding the necessity of each cylinder's being charged by the suction stroke of its own piston at the same time the burned gases are exhausted. Each piston has a raised portion before the inlet which deflects the gas to the top of the combustion chamber, thus forcing the burned gas out at the exhaust below. This arrangement of 2-cycle engine is claimed to be much more simple, efficient, and economical than the ordinary arrangement, and is said to be practically as efficient as a 4-cylinder 4-cycle engine of the same size, and of much greater fuel economy. Two tests are reported, in the first of which it is claimed that 43 h. p. were developed at 1,250 r. p. m. with a fuel consumption of 340 gm. per horsepower hour, and in the second 26 h. p. at 920 r. p. m. with a fuel consumption of 390 gm. per horsepower hour.

A note on steam plowing, A. A. MUSTO (*Dept. Agr. Bombay Bul. 54, 1912, pp. II+50, pls. 4*).—This bulletin deals with mechanical plowing outfits as regards their adoption in the Bombay Presidency. Detailed descriptions and sketches are given of 5 general systems, viz. (1) the direct traction system; (2) direct cable-drawn implements on the double-engine system; (3) indirect cable-drawn implements on the roundabout system with a traction engine fitted with winding drums; (4) indirect cable-drawn implements but with a portable engine driving a separate windlass; and (5) direct cable-drawn implements worked with bullock geared windlasses. The various conditions of soil, vegetation, and atmosphere in the Bombay Presidency are described as favorable to the profitable application of mechanical cultivation, particularly for the eradication of hariali grass, for which it is necessary to turn up the soil to a depth of at least 16 in. A badly infested area of 14 acres was plowed 14 to 16 in. deep. The work was started in January and finished in April, and by August the crop was looking remarkably well and the hariali grass was practically extinct.

From various service tests and operations statements of the advantages and disadvantages of each system are made with estimates of the capital outlay, the annual working expenses, and the cost per acre plowed for each system. The total capital outlay for an outfit of the first class, consisting of an 80 h. p. engine, balance plow, cultivator, and harrow, is estimated at 21,300 rupees (about \$6,900), and the annual working expenses at 8,650 rupees. With this outfit plowing by direct traction it is not possible to plow to a depth of more than 8 or 9 in. in black cotton soil, but it is estimated that with 2 shifts of men this engine will plow 8 acres per day of 14 hours to a depth of 8 in. at an average cost per acre of 8 rupees and 5 annas (about \$2.60).

The total capital outlay for an outfit of the second type, consisting of two 80 h. p. engines, plow, cultivator, and harrow, is estimated at 40,500 rupees, and the annual working expenses at 15,125 rupees. It is estimated that this outfit with 2 shifts of men will plow in black cotton soil 8 acres per day to a depth of from 16 to 18 in. at an average cost per acre of 14 rupees and 8 annas. When plowing at a depth of 8 or 9 in. with this outfit the cost per acre is estimated at 5 rupees and 13 annas (about \$1.90).

For an outfit of the third type, consisting of one 80 h. p. engine and other equipment, the total capital outlay is estimated at 28,800 rupees, and the annual working expenses at 9,986 rupees. It is estimated that with 2 shifts of men this outfit will plow 6 acres per day to a depth of from 16 to 18 in., at an average cost per acre of 14 rupees.

The total capital outlay for a small outfit of the fourth type of the cheapest possible construction, consisting of one 18 h. p. engine and other equipment, is estimated at 12,150 rupees, and the annual expenses at 3,867 rupees. It is estimated that with 2 shifts of men this outfit will plow 1 to $1\frac{1}{2}$ acres per day, to a depth of from 16 to 18 in., at an average cost per acre of 28 rupees and 4 annas.

For an outfit of the fifth type the total capital outlay is estimated at 3,196 rupees and the annual working expenses at 1,452 rupees. It is estimated that this outfit will plow $\frac{1}{4}$ acre per day in black cotton soil to a depth of from 16 to 18 in. and can be worked 150 days in a year, plowing $37\frac{1}{4}$ acres at an average cost of 39 rupees per acre.

Summing the results of all the investigations, the first type is considered applicable only for shallow plowing; the second type is considered the most efficient and economical of all, with the third type second; the fourth is not to be recommended on account of its complicated arrangement, difficulty in operation, and general inefficiency; and the fifth type is considered simple and reliable but slow and expensive.

New machines for vineyard spraying, G. COUPAN (*Génie Civil*, 63 (1913), No. 2, pp. 31-33, figs. 11).—Recent developments in vineyard spraying machinery are described and diagrammatically illustrated. The types include both power and liquid sprayers and machines both drawn and carried by animal power.

Stress analysis of circular tubes, B. HAUKEID (*Engin. Rec.*, 67 (1913), No. 24, pp. 669-672, figs. 11).—An analytical and graphical determination of stresses in tunnel sections under symmetrical, unsymmetrical, and variable loading is given.

Welding iron and steel, A. TORNUST (*Amer. Thresherman*, 15 (1913), No. 12, pp. 6, 88, figs. 9).—The author gives practical instructions for the welding, annealing, and hardening of iron and steel, which may be applied to general forge work on the farm.

Silo construction in Nebraska, L. W. CHASE (*Nebraska Sta. Bul.* 138, pp. 96, figs. 73).—This bulletin deals with the location, planning, erection, care, and cost of wood, pit, clay block, concrete block, and solid concrete silos, describes specific examples, and gives bills of material for each.

In connection with the construction of concrete block silos a design is furnished for a homemade concrete block machine and cuts shown of 2 silos made with such a machine.

The cost data show that the pit silos described cost per ton capacity from 75 cts. to \$2.27, of which from 16 to 76 cts. is for material. The total cost for the concrete block silos was from \$1.93 to \$3.94 per ton capacity, and the cost of materials from \$1.61 to \$2.66. The clay block silos had a total cost of \$1.70 to \$3.46 per ton capacity, of which the material cost from \$1.37 to \$1.88, and the solid concrete silos had a total cost of from \$2.65 to \$4.25 per ton capacity, of which the material cost from \$1.64 to \$3.09. A bill of materials for a 119-ton wood stave silo is given showing a total cost of \$269.31.

Numerous tables of designing and working data are included.

Silo construction in Nebraska, L. W. CHASE (*Nebraska Sta. Bul.* 138, popular ed., pp. 20, figs. 9).—A popular edition of the above.

Vacuum cleaning, M. S. COOLEY (*Heating and Ventilating Mag.*, 9 (1912), Nos. 2, pp. 39-45, figs. 7; 12, pp. 15-17, figs. 2; 10 (1913), Nos. 1, pp. 11-16, figs. 6; 2, pp. 13-19, figs. 10).—The ideal requirements of a vacuum cleaning system

are discussed and the results reported of tests of the efficiency of different types of vacuum cleaning apparatus under controlled conditions. Some general factors which should determine the choice of renovators for various purposes are given.

RURAL ECONOMICS.

Modern agriculture, D. ZOLLA (*L'Agriculture Moderne. Paris, 1913. pp. 327, figs. 10*).—This volume points out and discusses the various factors or agencies of production, showing the field of each and to what extent they have changed in relative importance within the last few years. Illustrations are given showing in a general way the economy of farm machinery in production; the effect of different systems of culture and types of farming brought about by scientific discoveries, drainage, and irrigation; the economic relation of live stock to production; the growth in agricultural credit and insurance associations; the effect of rural depopulation; the relation of advancing prices to agricultural production; etc.

Rural economy as a factor in the success of the church, T. N. CARVER (*Dept. Soc. and Pub. Serv. [Amer. Unitarian Assoc.], Soc. Serv. Bul. 8, pp. 20*).—The author discusses in this bulletin a number of factors entering into the success of the rural church, formulating as a general law of rural economy that the productive land in any farming community will tend to pass more and more into the hands of those who can cultivate it most efficiently, that is, men who can make the land produce the most will be able to pay the most for it and in the end will get it and hold it. The author concludes that the future of the rural church will therefore be governed largely by the Christians becoming as a rule better farmers than non-Christians.

Agriculture, banking, and the carrier, H. ELLIOTT (*Minneapolis, Minn., 1913, pp. 19*).—This is an address delivered before the American Institute of Banking in Minneapolis, Minn., April 26, 1913, in which the author shows by notes and statistics the effect of agriculture, banking, and the carrier upon the growth and prosperity of a number of northwestern States.

The relation between railroad rates and the cost of products to the consumer, F. S. WELSH (*N. Y. Dept. Agr. Bul. 35, 1912, pp. 931-934*).—This article discusses and gives a number of concrete examples showing prices received by producers of farm products in various sections of New York State, the prices paid for the same products in New York City, and the freight charges or cost of transportation from producer to consumer. It is pointed out that the difference in average price received by the New York farmer for pork in 1912 and that paid by the consumer was about 400 per cent, and that the transportation company received 1.25 per cent of the advance in price. It is noted further that the amount received by the railroad for transporting a number of commodities named a distance of approximately 300 miles was less than 3.5 per cent of the advance in price over what the farmer receives, averaging about 1.5 per cent of the final cost of the article.

To develop small farms (*Manfrs.' Rec., 63 (1913), No. 26, p. 70*).—This article discusses in a limited way the plan adopted by the agricultural department of the Central of Georgia Railway in cooperation with the landowners at Albany, Ga., to subdivide 4,000 acres of land into small farms and develop, and sell them at appraised prices on easy terms.

Industrial cooperation, edited by CATHERINE WEBB (*Manchester, England, 1912. 5. ed., rev., pp. XXII+287, pls. 5, figs. 6*).—This volume is expressly designed for use as a text-book, giving a comprehensive account of the history, theory, and practice of the cooperative movement in Great Britain and Ireland. Charts are given showing growth, production, and cooperative wholesale and

retail societies, agricultural societies, and other productive societies for a period of years. A lengthy bibliography is appended.

Association and agricultural cooperation, J. ELIAS DE MOLINS (*La Asociación y Cooperación Agrícolas. Barcelona, 1912, pp. 371*).—This volume treats of the causes, purpose, and value of agricultural cooperation in a general way, giving in addition concrete illustrations of what has been accomplished in a number of ways in various countries by cooperation and showing its social and economic effect upon agricultural life generally.

Cooperative marketing, W. H. INGLING (*N. Y. Dept. Agr. Bul. 35, 1912, pp. 1133-1142*).—This paper states the principle of cooperation, points out the essentials in its operation, and describes the work and progress of the Monmouth County Farmers' Exchange, previously noted (*E. S. R.*, 29, p. 392).

Financing cooperative marketing, W. O. RETHERFORD (*Pacific Rural Press, 85 (1913), No. 26, p. 710*).—This article points out and discusses the twofold necessity of the use of money in conducting the marketing of farm crops; one constituting a permanent investment in property and the other the amount necessary to finance the seasonal movement of crops. To supply the need of the latter it is suggested that certificates secured by farm products be substituted for money, the certificates being made redeemable in either products or legal money at the option of the marketing association. Such certificates would circulate in the same manner that the bank certificates circulated in a number of the States in 1907.

Cooperative buying and selling as it affects the producer and consumer, W. N. GILES (*N. Y. Dept. Agr. Bul. 35, 1912, pp. 1017-1024*).—This paper discusses briefly the principal elements entering into the cost of living, holding that when the consumer's dollar is equitably distributed among producer, transporter, and distributor and their interests correlated the problem of the high cost of living will be solved. Suggested plans are given to show that only by cooperation can such an arrangement be brought to pass. A number of concrete illustrations are given to show what has been done and what may be accomplished along this line.

Waste on the farm, A. H. E. McDONALD (*Agr. Gaz. N. S. Wales, 24 (1913), No. 5, pp. 385-387*).—A number of illustrations are given in this article showing the great waste which takes place on many farms. A harvester costing £90, for instance, with proper care may remain in good order for 10 or 12 years or with a depreciation of about £9 per year, while exposure to weather, lack of lubrication, and failure to keep repaired might cause it to depreciate as much as £18 per year.

The principle is applied to other farm equipment, farm machinery, etc.

A determination of the value and revenue from fruits and vegetables by the Christ-Junge method, LÖCKERMANN (*Deut. Landw. Presse, 40 (1913), Nos. 53, pp. 642, 643; 54, pp. 655, 656*).—This article compares various methods of calculating the value of land, its revenue, profitableness, etc., when used for the production of fruits and vegetables. The calculations and comparisons are made with particular reference to the Christ-Junge method, which is said to have been worked out with considerable mathematical precision.

Cost of producing cauliflower, J. F. DIMON (*N. Y. Dept. Agr. Bul. 35, 1912, pp. 899-901*).—This article discusses briefly the cost of producing cauliflower on Long Island, N. Y., giving the average cost per acre for a series of years, as follows: Rent, \$15; fertilizer, \$40; barrels, \$26; seed, \$3; Paris green, \$2; barnyard manure, \$5; labor, \$23; or a total of \$114. Some attention is also given to the operations of the Long Island Cauliflower Association (*E. S. R.*, 25, p. 336).

Production and marketing of Egyptian cotton, J. S. WILLIAMS and C. OUSLEY (*U. S. Senate, 63. Cong., 1. Sess., Doc. 113, 1913, pp. 10*).—This document represents a report of a committee appointed to study and report on cotton marketing in Egypt, which shows, among other things, that while Egyptian cotton is produced at a cost approximately no greater than American cotton (about 12½ cts., as compared with the American cost of 10 to 12 cts. per pound), by reason of its superior quality it sells for about 18 cts. per pound and American cotton from 11 to 12½ cts. The Egyptian output varies but little from year to year and is capable of but slight expansion. The committee advises that the cotton States establish a system of state regulated warehouses, thereby enabling farmers to store their cotton and secure cheap money upon warehouse receipts so that they may sell the crop gradually over a period of several months instead of forcing it upon the market, as they do now, within two or three months.

Earnings of agricultural laborers (*Field [London], 121 (1913), No. 3143, p. 549*).—The author points out in this article that there is an apparent fluctuation of agricultural wages in different localities in England. This he attributes to the difference in the amount paid in the various localities in the way of free rent of cottage, free milk, wood, coal, garden, etc. The usual money wage per annum is said to be about £47, and the wages in kind £7 or £8 per year.

Agricultural laborers' wages and earnings (*Farm and Home, 32 (1913), No. 1633, p. 365*).—This article calls attention to an investigation recently made in England to ascertain changes in wages and earnings of agricultural laborers for the last 5 years. The results show that the combined cash wages and other earnings for the whole of England increased from an average of 17s. 6d. a week in 1907 to 19s. 4d. in 1912. Average wages and earnings are given by counties.

Hints to homeseekers, W. J. GEIB (*Madison, Wis., 1913, pp. VIII+274, figs. 31*).—In addition to analyzing and discussing briefly the conditions and circumstances responsible for the "back to the land movement," this volume presents information concerning the agricultural and soil conditions and agricultural possibilities of a number of States in the United States and western Canada.

Statistics affecting British agricultural interests (*Jour. Roy. Agr. Soc. England, 73 (1912), pp. 339-348*).—Notes and tables are given showing the acreage under crops, number of live stock, total produce, and yield per acre of each of the principal crops of the United Kingdom in 1911 and 1912, with comparisons.

AGRICULTURAL EDUCATION.

Principles and policies that should underlie state legislation for a state system of vocational education ([*Nat. Soc. Prom. Indus. Ed. Pamphlet, 1913*], pp. 6).—A tentative statement of principles and policies formulated at a meeting of a committee of the National Society for the Promotion of Industrial Education is here presented.

State-aided vocational agricultural education (*Ann. Rpt. Bd. Ed. [Mass.], 76 (1911-12), pp. 122-129*).—In this report as to the progress made in Massachusetts in vocational training in agriculture for boys over 14 years of age, an increase of 35 per cent over last year is noted in the enrollment of the agricultural departments of the 5 high schools receiving state aid for agricultural instruction. The efforts made to connect the home-farm work of the pupils with the classroom instruction and the undertaking of home-farm projects by resi-

dent and nonresident pupils, under the supervision of competent instructors, are favorably commented upon. Tables are given showing reimbursements as to salary, tuition, etc., of state-aided agricultural departments in selected high schools, together with examples of the income of pupils from farm work performed during attendance at school.

Agricultural instruction in high schools, C. H. ROBISON and F. B. JENKS (*U. S. Bur. Ed. Bul.*, 1913, No. 6, pp. 80, figs. 7).—This bulletin gives a brief historical sketch of the growth of agricultural training in the schools and colleges of the United States; describes the organization of secondary schools in relation to the teaching of agriculture, with special reference to county, district, and state agricultural schools; presents data as to the training, experience, and salaries of the teachers of agriculture, showing that teachers as a rule who are able to teach agriculture receive better salaries than those who are unable to do so; gives the name, location, etc., of agricultural colleges offering special opportunities for preparing teachers of secondary-school agriculture; discusses the relation of agriculture to the other sciences, and its relation in the high school to that in the elementary school; points out and suggests ways of overcoming difficulties of instruction with reference to time, equipment, teacher, text-book, methods, attitude of students, patrons, etc.; briefly summarizes the provisions of state aid to agriculture in the public schools as made by the various state legislatures; and illustrates the possibilities of agricultural training by showing what is actually being done in a number of typical high schools teaching agriculture.

Evolution of the high-school course in agriculture, J. MAIN (*School Sci. and Math.*, 13 (1913), No. 6, pp. 508-516, figs. 5).—This article discusses various pedagogical methods of introducing agriculture into high schools and correlating it with other subjects, holding that such a course should grow not up from nature study or down from college agriculture but laterally from the formal side, whose pedagogical landmarks are too well established to be ignored. A number of diagrams are given graphically illustrating this method of approach.

Consolidation of school districts, F. A. COTTON, M. V. O'SHEA, and W. E. LARSON (*[Wis. State Supt. Pub. Instr.] Bul.* 17, pp. 93, pl. 1, figs. 23).—This bulletin represents a report prepared by a committee authorized to investigate the educational situation in Wisconsin, particularly in country districts. The committee directed its attention primarily to a study of rural education with reference to consolidation of district schools, and aims to show in this report just what consolidation means, why it is desirable, and how it can be accomplished under typical conditions existing in various sections of the State. The different phases of consolidation are treated in a simple, concrete, and practical way, and it is pointed out what has been accomplished along this line in Wisconsin and other States, what are the advantages of consolidation, and how any community may proceed to secure a consolidated school.

Report on agricultural and housekeeping schools in Norway for 1911-12 (*Aarsber. Offentl. Foranst. Landbr. Fremme*, 1912, II, pp. 352).—Reports on the faculty, students, finances, and work of the agricultural and housekeeping schools in Norway for 1911-12 are presented.

The Hanoverian Veterinary High School from the first director to the first president, 1778-1913, H. MEISZNER (*Deut. Tierärztl. Wchschr.*, 21 (1913), No. 25, pp. 385-416, figs. 45).—A detailed account is given of the development, buildings and equipment, organization of instruction, admission requirements, and the inauguration of the first president, Dr. Bernard Malkmus, on June 16, 1913.

A farmer's professional library: Bibliography of government publications suitable for use of agriculture in elementary and secondary schools, W. T. SKILLING (*San Diego, Cal.*, pp. 20).—This pamphlet enumerates various government publications suitable for use in teaching agriculture in elementary and secondary schools, and gives a brief abstract of each publication referred to. The publications are classified under the following subjects: Soil and alkali, irrigation and drainage, weeds, various crops, stock feed, fruits and berries, the dairy, farm animals, animal friends and enemies, poultry, birds, beneficial insects, miscellaneous insect pests, plant diseases, fungicides, the school garden, laboratory and field exercises in agriculture, and forestry.

Agricultural books, G. M. FRIER (*Purdue Univ. Dept. Agr. Ext. Bul. 5, 1912*, pp. 8, fig. 1).—This is a list of agricultural books for farm homes, school and public libraries, premiums in young people's contests, corn shows, etc.

Farm life readers, L. B. EVANS and L. N. and G. W. DUNCAN (*Boston, New York, Chicago*, [1913], *Books 4*, pp. 334, pl. 1, figs. 99; 5, pp. 372, pl. 1, figs. 76).—These volumes consist of a series of articles, covering in logical order the fundamental principles of agriculture; a number of prose selections, bearing on country life, the farm and the home; and poems relating to almost every phase of farm life. Their purpose is to furnish rural school pupils with such supplementary reading matter as will enlarge their ideas of country life, and show them the dignity of farm labor and the freedom, health, and prosperity that may come to those who live in the country and pursue the business of farming with intelligence and energy.

A method of recording the results of students' work in the soils laboratory, L. E. CALL (*Proc. Amer. Soc. Agron.*, 4 (1912), pp. 49-51).—In addition to a brief discussion of the exercises outlined for laboratory instruction in soils, the author describes the system of records employed by the Kansas State Agricultural College for this work.

Animal husbandry for schools, M. W. HARPER (*New York, 1913*, pp. XXII+409, pl. 1, figs. 152).—This is another of the Rural Text-book Series edited by L. H. Bailey. This book is designed to introduce the subject in the schools, and also in colleges when only a short time can be given to it. Each class of farm animals is considered separately and in a similar way.

Many exercises or practicums are suggested in the appendix. It is suggested that at least one exercise be used each week.

An elementary course of food chemistry, ZELLA P. EGDAHL (*Menomonie, Wis.*, 1913, pp. 87).—"In the preparation of this manual the aim has been to organize a practical course of food chemistry for secondary schools, and, also, to include in one book material from widely different sources. The exercises have been selected from books of organic, physiological, industrial, and sanitary chemistry, with the modifications necessary for secondary school work. The course requires an elementary knowledge of general chemistry."

School gardens, P. W. LINDHOLM (*Skolchaven. Copenhagen, 1911*, pp. 32).—This brief guide for the school garden teacher is intended as a supplement to the author's book on the Pedagogical School Garden.

Improving school grounds, LE R. CADY (*Minn. [Dept. Pub. Instr.] Bul. 36, 1912*, pp. 4-8, fig. 1).—A model of rural school grounds with trees, shrubbery, flowers and walk, and a planting list are included in these directions.

School gardens and garden work for children, O. MICHALKE (*Schr. Zentralst. Volkswohlfahrt, 1913*, No. 8, pp. 260-274).—This is an account of the present status of school gardening in Germany.

Home projects for school agriculture, A. W. NOLAN (*Agr. Col. Ext. Univ. Ill. [Circ.]*, 1913, Mar., pp. 37).—Twelve projects are outlined, one or more of which is expected to be chosen by each student in the class at the beginning of

the course in agriculture and carried through to the end of the course or until well worked out. This is in addition to the regular schoolroom work in agriculture, but an integral part of the course as a whole. Some of these projects deal with poultry raising, home dairy work, sowing a plat of alfalfa, growing potatoes, and caring for fruit trees.

Corn clubs, tomato clubs, and county school fairs in Virginia, T. S. SETTLE (*W. Va. Univ. Bul.*, 13. ser., 1912, No. 3, pp. 11-17, figs. 6).—This article describes briefly the work of these clubs in Virginia and how they are carried on with reference to the rural schools. The principal weakness of such organizations pointed out is that such a small percentage of the school children can do this work. To supply the need which this organization failed to satisfy the county school fair has been organized, which, in addition to giving each pupil an opportunity to engage in some form of agricultural, industrial, or domestic work, adds to the recreational life of country people. The manner in which these county fairs are carried out is illustrated and described in detail.

Organization and method of agricultural extension instruction, H. MIATELLO (*Buenos Aires: Min. Agr.*, 1912, pp. 62, pl. 1, figs. 18).—This scheme of agricultural extension instruction outlined by the author was approved by the American International Scientific Congress held at Buenos Aires in July, 1910, and is based on consultations, lectures, and demonstration experiments, supplemented by temporary courses, publications, competitions, exhibitions, distribution of seeds, agricultural societies, agricultural museums, etc.

Farm demonstration in agriculture (*New Jersey Stat. Circ.* 25, pp. 2-4).—This gives the text of the recent law which provides for a farm demonstrator in each county of the State of New Jersey.

MISCELLANEOUS.

Thirty-sixth Annual Report of Connecticut State Station, 1912 (*Connecticut State Sta. Rpt.* 1912, pt. 6, pp. XX).—This contains the organization list, a report of the board of control, a financial statement for the fiscal year ended September 30, 1912, and a list of corrections to the report.

Twenty-fifth Annual Report of Georgia Station, 1912 (*Georgia Sta. Rpt.* 1912, pp. 295-306).—This contains the organization list, reports by the president of the board of directors and the director of the station on its work during the year, and a financial statement for the fiscal year ended June 30, 1912.

Biennial Report of Missouri State Fruit Experiment Station, 1911-12 (*Missouri Fruit Sta. Rpt.* 1911-12, pp. 11).—This includes a financial statement for the biennial period ended December 31, 1912, and a report of the director on the work of the station for the biennium and the present needs.

Monthly Bulletin of the Department Library, May-June, 1913 (*U. S. Dept. Agr., Library Mo. Bul.*, 4 (1913), Nos. 5, pp. 129-160; 6, pp. 163-192).—These numbers contain data for the months of May and June, 1913, respectively, as to the accessions to the Library of this Department and the additions to the list of periodicals currently received.

Index to the Yearbooks of the United States Department of Agriculture, 1906-1910, C. H. GREATHOUSE (*U. S. Dept. Agr., Div. Pubs. Bul.* 10, pp. 146).—This is a combined subject and author index in continuation of work previously noted (*E. S. R.*, 20, p. 995).

NOTES.

Iowa College and Station.—Extension work is to be undertaken by each division of the college, but the supervision of all extension work has been placed under the president's office. The home economics department of the division of agriculture has been reorganized as an independent division with its own dean.

The budget for the fiscal year beginning July 1, aside from repairs and contingent and equipment funds, has been approved by the board of education for \$739,000. The contract has been let for the new chemistry building, which is to cost \$250,000 and to be completed July 1, 1914. This building will be 243 feet long by 160 feet wide, with three stories and basement. Much care has been given to the preparation of plans. Every room will be well lighted, and special attention is being given to ventilation, which will be by forced draft. The building will be of brick and in the form of the letter H, with a lecture room occupying the central portion of the main floor and an open court above this room. The four arms, with light on three sides, will be occupied by the principal laboratories. Space will be provided in the building for the chemical section of the station.

Montana College and Station.—Alfred Atkinson, who resigned last spring as professor of agronomy and agronomist to take up commercial work, has returned to his former position, beginning September 15. P. N. Flint, formerly of the Kansas College and Station, has been appointed professor of animal husbandry and animal husbandman. Howard Welch, D. V. M. (Cornell), has been appointed professor of veterinary science and veterinarian. A new grain laboratory was provided by the last legislature, and B. W. Whitlock, a graduate of the Kansas College, has been appointed in charge.

Texas Station.—A. H. Leidigh, assistant professor of farm crops in the Kansas College and assistant in farm crops in that station, has accepted a position as agronomist in charge of soil-improvement projects at both the main station and the state substations. He will also assist the director in the management of the substations, entering upon his new duties September 15.

West Virginia University and Station.—Recent appointments include M. J. Abbey, of the University of Utah, as professor of agricultural education and supervisor of agriculture for the state department of free schools; Dr. L. I. Knight, of the botanical department of the University of Chicago, as plant physiologist of the station, but also retaining his connection with the University of Chicago; Oliver Smith (Cornell, 1913) as assistant in agronomy; I. B. Johnson (Iowa College, 1913) as assistant in animal husbandry; and Nellie M. Barnett as instructor in home economics in the agricultural extension department. E. W. Sheets, state agent in charge of boys' club work in cooperation with this Department, has resigned to pursue graduate work at the University of Illinois, and has been succeeded by W. H. Kendrick.

Wyoming Station.—Dr. L. D. Swingle resigned October 1 as research parasitologist to become zoologist for the medical college of the State University of Utah, and has been succeeded by Dr. John W. Scott, formerly assistant professor of zoology in the Kansas College. E. V. Lynn has accepted the position of assistant research chemist, and J. E. McWilliams has been appointed assistant in the wool department.

ADDITIONAL COPIES of this publication
may be procured from the SUPERINTEND-
ENT OF DOCUMENTS, Government Printing
Office, Washington, D. C., at 15 cents per copy

Subscription price, per volume of 9 numbers, \$1



EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director*.
Assistant Editor: H. L. KNIGHT.

EDITORIAL DEPARTMENTS.

Agricultural Chemistry and Agrotechny—L. W. FETZER, Ph. D., M. D.
Meteorology, Soils, and Fertilizers—W. H. BEAL.
Agricultural Botany, Bacteriology, and Vegetable Pathology {W. H. EVANS, Ph. D.
W. E. BOYD.
Field Crops {J. I. SCHULTE.
G. M. TUCKER, Ph. D.
Horticulture and Forestry—E. J. GLASSON.
Foods and Human Nutrition {C. F. LANGWORTHY, Ph. D., D. Sc.
H. L. LANG.
Zootechny, Dairying, and Dairy Farming—H. WEBSTER.
Economic Zoology and Entomology—W. A. HOOKER, D. V. M.
Veterinary Medicine {W. A. HOOKER.
L. W. FETZER.
Rural Engineering—R. TRULLINGER.
Rural Economics—B. B. HARE.
Agricultural Education—C. H. LANE.
Indexes—M. D. MOORE.

CONTENTS OF VOL. XXIX, NO. 7.

	Page.
Editorial notes:	
Convention of Association of Agricultural Colleges and Experiment Stations.....	601
Closer relations between the Department of Agriculture and experiment stations.....	604
Recent work in agricultural science.....	608
Notes.....	696

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The physics and chemistry of colloids, Hatschek.....	608
Modifications in the properties of the proteins of gliadin, Vandevelde.....	608
Pectins of aucuba and sweet orange, Harlay.....	608
Takadiastase, Wohlgemuth.....	609
A color reaction of ammonia, Thomas.....	609
The titration of phosphoric and boric acids, Biltz and Marcus.....	609
Determination of potassium in fertilizers, soil extracts, and ashes, Davis.....	609
Estimation of lime in plant ashes, Gile and Ageton.....	609
Apparatus for the detection of carbon monoxid, Guasco.....	610
The determination of nitrates in soils and soil extracts, Hill.....	610
Estimation of cacao shells in cocoa powders, Kalusky.....	611
Methods for determining the quality of milk, Fred and Chappellear, jr.....	611
The detection of improperly heated milk, Drost.....	612
Refraction of milk serum and the control of the milk supply, Witte.....	612
Investigations in regard to milk biology with the anaphylactic method, Heuner.....	612
Bromin absorption of certain vegetable oils and fats, Sprinkmeyer and Diedrichs.....	612
A new oxygen absorption method for oils, Wilson and Heaven.....	613

Influence of peptones on estimation of sugars by Fehling's solution, Bernardi.....	613
Determination of traces of iron in sugar refinery products, Eastick et al.....	613
Precipitate by mercuric acetate from molasses; adenin, Stoltzenberg.....	614
The grinding of spruce for mechanical pulp, Thickens.....	614
The occurrence of lactic acid in sisal, McGeorge.....	615

METEOROLOGY—WATER.

Meteorology for the farm and weather forecasting, Granderye.....	615
Evaporation conditions at Skokie Marsh, Sherff.....	615
Evaporation from water and soil surfaces in the Livermore Valley, Espy.....	615
Suggestions for frost protection, Kellerman.....	616
Weather record, 1912, Burke.....	616
Report of the consulting meteorologist, Voorhees.....	616
Meteorological data, January 1, 1910, to December 31, 1912.....	616
Water supply of District of Columbia and power at Great Falls, Langfitt et al.....	616
Water power of [rivers of the northern half of] Indiana, Tucker.....	616
Chemical and biological survey of the waters of Illinois.....	617
The mineral content of Illinois waters, Bartow et al.....	617
The utilization of sewage, Soper.....	617
Sewage purification at Atlanta, Ga.....	617

SOILS—FERTILIZERS.

Soil temperature and some important factors influencing it, Bouyoucos.....	618
Soil moisture, Willard and Humbert.....	620
The fixation of nitrogen in Colorado soils, Headden.....	621
A study of nitrification in certain types of Virginia soil, Fred.....	621
The use of forest humus in agriculture, Ehrenberg and Bahr.....	622
Report of the physiologist, Loew.....	622
Report of the chemist, Gile.....	623
Relation of calcareous soils to pineapple chlorosis, Gile.....	623
Soil acidity and liming, Whitson and Weir.....	623
The Illinois system of permanent fertility, Hopkins.....	623
Shall we use "complete" commercial fertilizers in the corn belt? Hopkins.....	623
Effect of fertilizers on the soluble plant food and crop yield, Ellett et al.....	623
The changes in phosphorus in fermenting mixtures, Totttingham and Hoffmann.....	624
Formation of nitrate from peat nitrogen, Iakushkin.....	624
Solvent action of ammonium salts on phosphorite in sand cultures, Chirikov.....	624
Superphosphates of different kinds in sand cultures, Kalinkin and Iakushkin.....	624
The assimilation of metaphosphate and pyrophosphate by plants, Arnoldi.....	624
Absorption of potash from zeolites by plants, Chirikov.....	625
Vegetation experiments with potash minerals in 1911, Kalinkin.....	625
Vegetation experiments with potash minerals in 1912, Chirikov.....	625
On the action of sodium salts in vegetation experiments, Iakushkin.....	625
Gunpowder as fertilizer.....	625
Fresh sludge and decomposed sludge, Bach and Frank.....	625
The fertilizing value of pond mud, Kossowitsch.....	625
Commercial fertilizers, Jones, jr., et al.....	626
Analyses of commercial fertilizers, Hartwell et al.....	626
The Missouri fertilizer law, Mumford.....	626

AGRICULTURAL BOTANY.

Twenty-five years of botany in Iowa, Macbride.....	626
Native dye plants and tan plants of Iowa, with notes on other species, Kellogg.....	626
Botanical features of the Algerian Sahara, Cannon.....	626
The coefficient of humidity: A new method of expressing soil moisture, Crump.....	626
Osmotic pressure and related forces as environmental factors, Livingston.....	627
Some quantitative researches on the permeability of plant cells, Osterhout.....	627
The organization of the cell with respect to permeability, Osterhout.....	628
Structure and function of the skin of the potato tuber, Stoward.....	628
The study of nitrogen nutrition in plants, Pouget and Chouchak.....	628
Arsenic and manganese in leaves at different ages, Jadin and Astruc.....	628
Replacement of zinc by copper in the culture of <i>Aspergillus niger</i> , Lepierre.....	628
The action of sulphuric acid on seeds, Bianchi.....	628

	Page.
The germination of barley, Birckner.....	629
Modifications and anomalies due to suppression of the endosperm, Urbain.....	629
Floral anomalies in maize, appearing spontaneously in 1912, Berthault.....	629
Induced semiparasitism in cress, Molliard.....	629
A physiological study of the legume bacteria, Fred.....	629
A cultural and morphological study of some <i>Azotobacter</i> , Jones.....	630
The use of stains in the study of bacteria, Fred.....	630
Bibliography of smoke prevention: Effect on vegetation, McClelland.....	630

FIELD CROPS.

[Field crops at the Fergus County substation], Stephens.....	630
Forage crops, Ritzman.....	631
Experiments with legumes and grasses, Dammann.....	631
Irrigation experiments at Koppenhof, Krüger.....	631
Cultivation and irrigation experiments, Krüger.....	632
Utilization of light calcareous soils for intensive cultivations, Jouzier.....	632
Field experiments, 1911.....	632
Top-dressing pastures, Gibb.....	632
Experiments in fertilizing natural prairie at Bretagne, Fourton and Compain..	632
The size of the seed and the fertility of the plant, Harris.....	632
Crimson clover: Growing the crop, Westgate.....	633
Corn culture and improvement, McClelland.....	633
Mosaic coherence of characters in seeds of maize, Collins.....	633
Maize from the Sudan.....	633
Ten years of corn breeding, Funk.....	633
Annual report of the Nebraska Corn Improvers' Association.....	633
Cotton farming in the Southwest, Cook.....	634
The improvement of cotton in India.....	634
Cropping to flax on new lands of semiarid land areas, Bolley and Wilson....	634
Flax breeding experiments in 1909-1911, Althausen.....	634
Comparison of yield between hybrids and selections in oats, Love.....	635
Report on the experimental potato fields, 1911-12, Seymour.....	635
The culture of rice in Madagascar, Galtié.....	635
Sugar-beet culture in South Dakota, Shepard.....	635
Storing and marketing sweet potatoes, Thompson.....	635
The Cornell experiments in breeding timothy, Webber.....	635
Inheritance of the winter resistant character of winter wheat, Nilsson-Ehle....	635
The spontaneous appearance of a wheat hybrid, Kajanus.....	636
The management and care of plant breeding plats, Kiessling.....	636
Plant breeding in Scandinavia, Newman.....	636
The adulteration and misbranding of the seed of hairy vetch, Taylor.....	636
The weed problem, Pammel.....	637

HORTICULTURE.

Report of the horticulturist, Kinman.....	637
Horticultural investigations at the Woburn Experimental Fruit Farm.....	638
Vegetable culture in north Louisiana, Watson.....	638
Inheritance in cabbage hybrids, Price.....	638
Cabbage and cauliflower in Montana, Schermerhorn.....	639
Celery culture in Montana, Whipple.....	639
The cultivation of American ginseng, Van Fleet.....	639
[Horticultural statistics], Robertson.....	639
Information for commercial and home planting, Winslow.....	639
Fertilizer experiments with fruit trees, Magnien.....	639
Influence of fertilizers on the conservation of fruits, Espauillard.....	640
The diseases of fruit trees, Ewert.....	640
Spraying investigations for 1912, Hewitt.....	640
Fumigation and spraying, Garman.....	640
The new Arkansas law with reference to nursery stock.....	641
Storage of apples in peat dust, Nyström.....	641
Grape breeding, Muth.....	641
Sugar and acid in oranges and grapefruit, Collison.....	641
Report of the assistant horticulturist, McClelland.....	641
The banana in Fiji, Knowles and Jepson.....	642

	Page.
Annonaceous possibilities for the plant breeder, Wester	642
The development of the red hybrid tea rose	642
FORESTRY.	
The relation of forests to humidity, Zon	642
Pros and cons on the forest and flood question, Roberts	642
Forest laws of Vermont and instructions regarding forest fires, Hawes	642
Forestry in Trinidad, Rogers	643
Present state of forestry in Portugal, Borges	643
Forest administration in Central Provinces and Berar, 1911-12, Hill et al.	643
Progress report on forest administration in the Punjab for 1911-12, Copeland ..	643
Forest distribution in the San Juan Islands, Rigg	643
The indigenous trees of the Hawaiian Islands, Rock	643
Important and noteworthy woody plants of German East Africa, I, Holtz	643
Vitality and distribution of growth in defoliated larch trees, Harper	643
Some Douglas fir plantations.—I, Taymount plantation, Perthshire, Scott	644
Rubber experiments in Trinidad and Tobago, Collens	644
Rubber experiments in British Guiana, Harrison et al.	644
The rubber-tree book, Maclaren	644
Report on the wood-using industries of Florida, Maxwell	644
Cooperage, Wagner	644
DISEASES OF PLANTS.	
The vegetable parasites of cultivated or useful plants, Ferraris	644
The nature of fungus diseases of plants, Johnston	645
Further cultures of heteroecious rusts, Fraser	645
<i>Mycosphaerella pinodes</i> the ascigerous stage of <i>Ascochyta pisi</i> , Vaughan	645
Effect of the steam-formalin treatment on certain soil organisms, Winston	645
Plant diseases in Virginia in the years 1911 and 1912, Reed and Crabill	645
Review of diseases and injuries of cultivated plants, Morstatt	645
Helminthosporium diseases of barley in Wisconsin, Johnson	645
Winter resistance of the uredospores of <i>Puccinia coronata</i> , Reed and Holmes ..	645
Agar culture of wheat as a means of seedling purification, Milbrath	645
The possibilities of disease resistance in cabbage, Jones	646
Sclerotinia on chicory	646
The small lettuce Sclerotinia, an undescribed species, Jagger	646
Disease of peanuts caused by <i>Bacterium solanacearum</i> , Fulton and Winston ..	646
Leaf roll, curly leaf, and other new potato diseases, Orton	646
Important potato diseases, Köck	646
Resting mycelia of <i>Phytophthora</i> and other related species, Melhus	646
Flowers of sulphur as protection against potato scab, von Feilitzen	646
Damping-off and root-rot parasites of sugar beets, Edson	646
On two species of <i>Heterosporium</i> , particularly <i>H. echinulatum</i> , Dowson	647
Notes on the fungus diseases of sugar cane in Porto Rico, Johnston	647
<i>Fusarium batatas</i> , the cause of the sweet potato stem rot, Harter and Field ..	647
The infection of apple leaves by <i>Gymnosporangium macropus</i> , Fulton	647
Effect of <i>Gymnosporangium</i> on the transpiration of apple trees, Reed and Cooley ..	647
Effect of cedar rust on assimilation of carbon dioxide, Reed and Cooley	648
The enzym activities involved in certain fruit diseases, Reed	648
Studies on <i>Phyllosticta</i> and <i>Coniothyrium</i> occurring on apple foliage, Crabill ..	648
Twig blight and blossom blight of the apple, Hewitt	649
An unknown apple-tree disease, Hewitt and Truax	649
The greening of wood of pear trees, Vuillemin	649
<i>Gronartium ribicola</i> and the proscripton of <i>Ribes nigrum</i> , Stewart and Rankin ..	649
Diseased gooseberry bushes, Steffen	649
Report of the plant pathologist, Fawcett	650
Black pit of lemon, Smith	650
The American Botrytis blight of peonies, Whetzel and Rosenbaum	650
Attack of cultivated roses by <i>Peronospora sparsa</i> , Bretschneider	650
The diseases of the sweet pea, Taubenhaus	650
The Thielavia disease of violets, Reddick	650
Some field experiments with the chestnut canker fungus, Rankin	651
Twig tuberculosis of the Italian cypress, Neger	651
Fungicides, their preparation and application, Sharples	651

ECONOMIC ZOOLOGY—ENTOMOLOGY.

	Page.
The control of prairie dogs and ground squirrels, Spaulding.....	651
The war against field mice in France, Boyer.....	651
The rat, its habits and their relation to antiplague measures, Creel.....	651
Note on leprosy in rats, Ridlon.....	651
Fumigation of vessels for the destruction of rats, Grubbs and Holsendorf.....	651
The economic importance of the little owl in England.....	651
An annotated list of the literature on insects and diseases for 1912, Doane.....	652
Tenth annual report of the state entomologist of Montana, Cooley.....	652
Report of the entomologist, Hooker.....	652
Report of state entomologist and plant pathologist for 1912, Bentley.....	653
Report of the state entomologist, Bentley.....	653
[Entomological notes], Jones.....	653
Annual report for 1912 of the zoologist, Warburton.....	653
The fauna of the German colonies, Aulmann.....	653
Insect pests of the household, Whitmarsh.....	653
Soil-infesting insects, Headlee.....	653
A probable parasite of <i>Scapteriscus didactylus</i> in Cuba, Cardin.....	653
A successful trap for cockroaches, Washburn.....	653
The chinch bug situation in Kansas, Dean and McColloch.....	653
A note on two elm leaf aphids, Patch.....	654
Aphid pests of Maine, II, Patch.....	654
Preliminary report on parasites of <i>Coccus hesperidum</i> in California, Timberlake.....	654
Scale insects upon citrus trees and methods for their control, Gough.....	654
<i>Icerya purchasi</i> in the Department of Alpes-Maritimes, Molinas.....	654
Insect pests of the New Zealand flax (<i>Phormium</i>), French, jr.....	654
A brief report on the piojo blanco of cotton, Townsend.....	654
The Phoenix skipper (<i>Pamphila dysmephila</i>), Kelly.....	655
<i>Hypocæna philippus</i> , an enemy of pineapples in Sao Paulo, Brazil, Bondar.....	655
Sericulture in the valley of the Yalung, Legendre.....	655
The apple tree tent caterpillar (<i>Malcosoma</i> (<i>Clisiocampa</i>) <i>americana</i>), Britton.....	655
Fall army worm (<i>Laphygma frugiperda</i>), Dew.....	655
The fight against the <i>Cochylis</i> moth, Moreau and Vinet.....	655
The control of <i>Polychrosis botrana</i> in Switzerland in 1912, Faes.....	655
Unspotted tentiform leaf miner of the apple (<i>Ornix geminatella</i>), Haseman.....	655
The flour moth and its control, Cleare, jr.....	655
Gouty pine midge (<i>Itonida inopis</i>), Felt.....	656
Device for detecting flight of mosquitoes, Haskell.....	656
Determining the flight of mosquitoes, Zetek.....	656
The yellow-fever mosquito (<i>Aedes calopus</i>), Howard.....	656
The reduction of domestic flies, Ross.....	656
The sheep maggot fly pest in Australia, Froggatt and Cooper.....	656
The use of kerosene to trap the Mediterranean fruit fly, Severin.....	656
Fruit fly control, Winter.....	656
Mally fruit fly remedy: Its applicability in towns, Lounsbury.....	657
The Peruvian fruit fly (<i>Anastrepha peruviana</i> n. sp.), Townsend.....	657
Agromyzinae, Milichiinae, Ochthiphilinae, and Geomyzinae, Melander.....	657
Notes on the bean fly (<i>Agromyza phaseoli</i>), Jarvis.....	657
The Chrysomelidae and Coccinellidae of the Philippines, II, Weise.....	657
A new host plant of the California grape root worm (<i>Adoxus obscurus</i>), Branigan.....	657
The branch and twig borer (<i>Polycæon confertus</i>), Essig.....	657
A contribution to the habits of <i>Otiorynchus rotundatus</i> , von Sengerken.....	657
A new insect pest to roses, "the vine curculio" (weevil), French, jr.....	657
The <i>Anthonomus</i> of the raspberry and strawberry (<i>Anthonomus rubi</i>).....	658
Preliminary report on the picudo of cotton in Peru, Townsend.....	658
Observations on the egg parasites of <i>Datana integerrima</i> , Russell.....	658
<i>Habrobracon hebetor</i> and the Mediterranean flour moth, Buchwald and Berliner.....	658
Observations on the habits and reproduction of <i>Habrobracon hebetor</i> , Berliner.....	658
Some methods of handling minute hymenopterous parasites, Holloway.....	658
Report of the assistant entomologist, Cotton.....	658
Report of the assistant entomologist, Cotton.....	658
Sheep grazing as a possible means of controlling the wood tick, Fricks.....	658
<i>Rhizoglyphus echinopus</i> as an orchid pest, Sirks.....	659

FOODS—HUMAN NUTRITION.

Analysis and value of concentrated or condensed chicken soup, Congdon.....	659
Researches on frozen meat, Ascoli and Silvestri.....	659

	Page.
The use of preservatives with fish, Pouchet.....	659
The chemical composition of cooked vegetable foods, III, Williams.....	659
Studies of the digestibility of several different kinds of bread, Hindhede.....	660
Bakers' bread, Richards.....	660
Oats in human diet, Moreau.....	660
Extraction, cleaning, and utilization of nut kernels, Groud.....	660
Diabetic foods, Street.....	660
Diabetic foods offered for sale in the United States, Street.....	660
Commercial chicories, Collin.....	660
Artificial colors used in manufacture of food products, Gautier, Béhal et al....	661
[Food analyses and other pure food and drug topics], Ladd and Johnson.....	661
New ways and old—a manual of cookery adapted to the gas range, Caring.....	661
Camp cookery, Milam and Smith.....	661
Recent changes in field rations and their preparation, Fisher.....	661
Health through diet, Haig.....	661
The effect of completely hydrolyzed food on the digestive tract, Cohnheim.....	662
Ferments of the pancreas.—I, Generation of trypsin, Mellanby and Woolley....	662
Ferments of the pancreas.—II, Action of calcium salts, Mellanby and Woolley....	662
Tryptic digestion of milk raw and dried at high temperatures, Aviragnet et al....	662
Effect of light and dark meat on the urine, von Siewert and von Zebrowski....	663
Physiology of carbohydrate introduced into the body in excess, Griniew.....	663
The effect of sugars on digestion, Thomsen.....	663
Measure of the glycolytic power by the study of nitrogen elimination, Magne....	663
The value of seasoning in the diet, Gigon.....	663
Lime in the dietary.....	664
The importance of lecithin in the metabolism of adults, Cronheim.....	664
The necessity of certain lipins in the diet during growth, McCollum and Davis....	664
Studies on beri-beri.—VII, Chemistry of the vitamin-fraction, Funk.....	664
Fasting studies.—XI, Muscle from fasting dogs, Biddle and Howe.....	664
A new method of recording the respiration of man, Tullio.....	665

ANIMAL PRODUCTION.

[Ancestry and heredity], Lehmann.....	665
The Mendelian law and its application to domestic animals, Calderón.....	665
The drawing up and printing of pedigrees, Wilsdorf.....	665
Terminology on the structure of animals and plants, Roux et al.....	665
Individuality of the chromosome, Ohly.....	665
Passage of products of digestion of albuminoids from mother to fetus, Buglia....	665
The pepsin and chymosin question, Rakoczy.....	665
[Nutrition experiments], Völtz.....	665
Concentrated feeding stuffs.—Law and registration, Cathcart et al.....	665
The Kansas feeding-stuffs law revision of 1913.....	666
Western grazing grounds and forest ranges, Barnes.....	666
Report of the animal husbandman, Ritzman.....	666
Administrative measures taken in Holland in favor of cattle breeding, Löhnis....	666
Progress of cattle breeding in Denmark and Sweden, Dade.....	666
Cattle breeding in Dutch East Africa, Lichtenheld.....	666
The past year in the Australian meat trade.....	666
Report of the animal husbandman, Willson.....	666
Report of the animal husbandman, Willson.....	667
Corn silage for fattening 2-year-old steers, Allison.....	667
Calf-feeding experiments with separated milk and oils, Hendrick.....	667
Whole and corrected skim milk in rearing calves and pigs, Wellmann.....	668
Roughage for fattening lambs, Wilson.....	669
Sheep and wool for the farmers, Mathews.....	669
Sheep breeding in Hungary, Kovácsy.....	670
Forage crop rotations for pork production, Mumford and Weaver.....	670
Report on pig feeding experiments, Wale.....	671
Swine feeding experiments with hominy feed in comparison with barley, Klein....	671
Fattening of pigs with the automatic feeder, De la Barre.....	671
Action of iron-containing blood meals on iron assimilation, Gróh.....	671
The regular irregularities of the pulse of the horse, Stegemann.....	671
Stomach digestion of normally fed and watered horse, Scheunert and Schattke....	671
The profitable breeding of horses, Shannon.....	672
[Report on poultry], Graham.....	672

	Page.
Ten years' egg-laying tests, Dunnicliff, jr.	672
Egg-laying competitions, 1912-13, Laurie.	672
Fur farming for profit, Laymon.	672
Breeding mink for their fur, Norton.	673
Canadian live-fox shipments, Woodward and White.	673

DAIRY FARMING—DAIRYING.

Report of the dairy and cold storage commissioner, Ruddick et al.	673
Report of the dairy experiment station of Posen for 1912-13, Tiemann et al.	673
Milk records, Mathews.	673
Can a dairy cow be judged by a 2-year-old record, Eckles.	673
Importance of the sire in breeding for weight and milk production, Bruchholz.	673
Cost of milk production, Manning and Jones.	673
The composition of milk, Richmond.	673
Composition of certain brands of condensed milk, Brownlee.	674
The care of cream, Perkins.	674
A method for the improvement of buttermilk from pasteurized cream, Lang.	674
Creamery organization and management, Jones.	674
The manufacture of cheese from heated milk, Benson and Evans.	674
Maturing cheese by electricity.	675
Homemade cheese, Wiley.	675
The marketing of Wisconsin cheese, Taylor, Schoenfeld, and Wehrwein.	675
West country cheeses, Friday et al.	675
Manufacture of dried casein.	676

VETERINARY MEDICINE.

A course in normal histology, Krause, trans. by Schmahl.	676
Studies from the Rockefeller Institute for Medical Research.	676
Annual report of civil veterinary department, United Provinces, 1913, Wilson.	676
Diseases prevalent among horses and cattle in Mississippi, Ranck.	676
Trypanosomiasis in horses, trypanosomiasis and tuberculosis in camels, Mason.	676
Treatment of grass land with a view to elimination of disease, Penberthy.	676
A review of the present situation as regards infectious protozoa, Tidswell.	676
A systematic study of the Coccaceæ in the Museum of Natural History, Kligler.	676
Use of formalinized sheep cells in complement fixation, Bernstein and Kaliski.	676
The recent work of Bernstein and Kaliski, Armand-Delille and Launoy.	677
Epidemic in rabbits resembling that by <i>Bacillus necrosis</i> , Beattie et al.	677
A note on the maintenance of virulence by <i>Bacillus abortus</i> , Surface.	677
Contagious abortion in cows, Tidswell.	677
Foot-and-mouth disease in Ireland.	677
The agglutination of the glanders bacillus by normal horse serum, Oyuela.	677
Results with diagnostic methods for glanders in Austria in 1910, Schnürer.	677
The conjunctival reaction for glanders (ophthalmic test), Meyer.	677
A treatise on rabies, Babes.	679
Salvarsan in experimental rabies, Marras.	679
Salvarsan against anthrax and rabies, Isabolinsky.	679
The treatment of tetanus, McClintock and Hutchings.	679
Adult forms of <i>Trypanosoma americanum</i> in naturally infected animals, Johns.	680
Treatment of calf dysentery, Münich.	680
The tick killing properties of sodium arsenate, Cooper and Laws.	680
Vaccination against sheep pox by a sensitized virus, Bridré and Boquet.	680
Vaccination against pox in sheep by a sensitized virus, Bridré and Boquet.	680
Vaccination against sheep pox by the use of sensitized pustules, Panisset.	681
Poliomyelitis in sheep suffering from "loupin" ill, M'Gowan and Rettie.	681
Studies on the virus of hog cholera, King, Baeslack, and Hoffmann.	681
Some experiences with hog cholera, Parker.	682
A practical treatise on horseshoeing, Tasset.	682
Rate of reproduction of constituents of blood of immunized horse, O'Brien.	682
Equine piroplasmiasis in Panama, Darling.	682
<i>Bacillus bronchisepticus</i> .—Its relation to canine distemper, Ferry.	682

RURAL ENGINEERING.

Principles of irrigation engineering, Newell and Murphy.	683
Irrigation works in India, Benton.	683
Measurement of water, Kneale.	683

	Page.
Artificial controls of stream gaging stations, Adams.....	683
Stream measurements for the calendar year 1911, Peters and Sauder.....	683
Distribution of water, Van Reenen.....	684
Drainage of irrigated soils, Mosséri.....	684
Tests of cement and clay drain tile and sewer pipe, Marston and Anderson....	685
Action of salts in alkali water and sea water on cements, Bates et al.....	686
Reports of road engineers, Pratt et al.....	687
Tar spraying and tar macadam in situ, Aitken.....	687
The "sticky" test for bitumens, Osborne.....	687
Typical specifications for fabrication and erection of steel highway bridges....	688
Power farming, Olney.....	688
The roller or packer, Bonebright.....	688
A portable grain-drying machine, Höltzermann.....	688
Small farm buildings of concrete.....	689
Brief notes on modern silo construction, Morris and Bosman.....	689
[Silo construction].....	689
Efficient poultry housing, Simmonds.....	689
A model fireproof farmhouse or country home, Himmelwright.....	689

RURAL ECONOMICS.

The farmer's income, Spillman.....	689
Cost of producing farm crops, Porter.....	690
The sugar industry, Sheridan.....	690
Cost accounting on farms, Warren.....	690
Farm accounts, Hunter.....	691
Work of American commission respecting agricultural finance, etc., Fletcher..	691
State loans to farmers, Duffus.....	691
Farm credit in a northwestern State, Jacobstein.....	691
How to operate a mortgage bank, Woodruff.....	692
Farmers and the taxation of land values, Fels.....	692
Cooperation for better farming with county agriculturists, Cooley.....	692
The farm bureau making good in Chautauqua County, N. Y., Loomis.....	692
Commercial and agricultural organizations of the United States.....	693
Cooperation among agriculturists in Holland, Listoe.....	693
A short survey of the Danish agriculture, Hansen, Madsen, et al.....	693

AGRICULTURAL EDUCATION.

The sequence and development of courses in horticultural instruction, Erwin..	693
Class-room methods of teaching pomology, Wilson.....	694
Teaching pomological laboratory work, Paddock.....	694
The agricultural college and rural economics, Pugsley.....	694
Outlines for secondary courses in agriculture.....	694
Rural school agriculture, Kent.....	695
Instruction in home economics and agriculture for young girls, Carré.....	695
Good Roads Arbor Day, compiled by Sipe.....	695
The value of agricultural club work in New England, Morton.....	695
Elementary agriculture in the rural schools of Missouri, Emberson.....	695

MISCELLANEOUS.

Report of the director for the year ending June 30, 1912, Mumford.....	696
Nineteenth Annual Report of Montana Station, 1912.....	696
Annual Report of Porto Rico Station, 1912.....	696
Twenty-fourth Annual Report of Tennessee Station, 1911.....	696
Twenty-fifth Annual Report of Tennessee Station, 1912.....	696
Twenty-fifth Annual Report of Texas Station, 1912.....	696
Annual Reports of Virginia Station, 1911 and 1912.....	696
Fergus County substation: Report on the work and plans, Stephens.....	696
Experiment Station Work, LXXVI.....	696

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

<i>Stations in the United States.</i>		<i>Stations in the United States—Contd.</i>	
	Page.		Page.
Arkansas Station:		New Mexico Station:	
Bul. 112, 1912.....	649	Bul. 86, Apr., 1913.....	620
Bul. 113, 1913.....	649	North Dakota Station:	
Bul. 114, 1913.....	640	Bul. 103, Mar., 1913.....	634
Circ. 17, May, 1913.....	641	Bul. 104, Apr., 1913.....	690
Colorado Station:		Spec. Bul., vol. 2, No. 12, Jan., 1913.....	661
Bul. 186, May, 1913.....	621	Spec. Bul., vol. 2, No. 13, Feb., 1913.....	661
Connecticut State Station:		Spec. Bul., vol. 2, No. 14, Apr., 1913.....	661
Bul. 177, Aug., 1913.....	655	Spec. Bul., vol. 2, No. 15, May, 1913.....	659, 661
An. Rpt. 1913, pt. 1.....	660	Spec. Bul., vol. 2, No. 16, June, 1913.....	661
Florida Station:		Ohio Station:	
Bul. 115, July, 1913.....	641	Bul. 253, Dec., 1912.....	653
Hawaii Station:		Circ. 134, Apr. 25, 1913.....	674
Press. Bul. 42, May 21, 1913..	633	Porto Rico Station:	
Illinois Station:		Bul. 11 (Spanish Ed.), June 24, 1913.....	623
Circ. 165 (2. ed., rev.), Dec., 1912.....	623	An. Rpt. 1912.....	609, 622, 623, 631, 637, 641, 650, 652, 666, 696
Circ. 165 (3. ed., rev.), Feb., 1913.....	623	Porto Rico Sugar Producers' Station:	
Circ. 165 (4. ed., rev.), May, 1913.....	623	Circ. 2, May, 1913.....	645
Circ. 166, May, 1913.....	674	Rhode Island Station:	
Circ. 167, May, 1913.....	623	Insp. Bul., June, 1913.....	626
Indiana Station:		South Dakota Station:	
Bul. 166, May, 1913.....	626	Bul. 142, Jan., 1913.....	635
Kansas Station:		Bul. 143, Apr., 1913.....	669
Circ. 29.....	653	Tennessee Station:	
Circ. 30.....	666	Twenty-fourth An. Rpt. 1911.....	616, 658, 666, 667, 696
Kentucky Station:		Twenty-fifth An. Rpt. 1912....	616, 653, 658, 696
Bul. 172, May 1, 1913.....	640	Texas Station:	
Louisiana Stations:		Twenty-fifth An. Rpt. 1912....	696
Bul. 141, July, 1913.....	638	Virginia Station:	
Maine Station:		An. Rpts. 1911-12. 610, 611, 616, 621, 623, 629, 630, 638, 645, 647, 648, 696	
Bul. 213, June, 1913.....	654	Wisconsin Station:	
Michigan Station:		Bul. 230, May, 1913.....	623
Tech. Bul. 17, Feb., 1913....	618	Bul. 231, Apr., 1913.....	675
Mississippi Station:		Research Bul. 29, May, 1913..	624
Circ., Diseases Prevalent Among Horses and Cattle, July, 1913.....	676	U. S. Department of Agriculture.	
Missouri Station:		Circ. 45.....	636
Bul. 110, Feb., 1913.....	670	Farmers' Bul. 547.....	656
Bul. 111, Feb., 1913.....	696	Farmers' Bul. 548.....	635
Bul. 112, May, 1913.....	667	Farmers' Bul. 549.....	696
Circ. 58, Jan., 1913.....	626	Farmers' Bul. 550.....	633
Montana Station:		Farmers' Bul. 551.....	639
Bul. 92, Nov., 1912.....	652	Forest Service:	
Bul. 93, July, 1913.....	630, 696	Bul. 127.....	614
Circ. 20, Dec., 1912.....	651	Bureau of Plant Industry:	
Circ. 21, Feb., 1913.....	688	Circ. 132.....	633, 634, 689
Circ. 22, Mar., 1913.....	634	Office of Public Roads:	
Circ. 23, Feb., 1913.....	674	Circ. 100.....	688
Circ. 24, Feb., 1913.....	683		
Circ. 25, Feb., 1913.....	639		
Circ. 26, Feb., 1913.....	639		
Circ. 27, Apr., 1913.....	692		
Nineteenth An. Rpt. 1912..	616, 696		
New Jersey Stations:			
Bul. 256, May 7, 1913.....	665		
Circ. 26.....	653		

EXPERIMENT STATION RECORD.

VOL. XXIX.

NOVEMBER, 1913.

No. 7.

The conventions of the Association of American Agricultural Colleges and Experiment Stations are of increasing importance from year to year. The rapid development of these institutions and the extension of their activities and relationships constantly present new questions of common interest and importance to all the States, and the methods to be followed in this comparatively new field are matters to which increasing importance is attached. Only by such gatherings can a broad common viewpoint be gained, and united action secured for the advancement of the work as a whole.

The Washington meeting in the middle of November was no exception to the rule of increasing importance, and in several ways may be regarded as highly significant. It marked the culmination of several matters which have been prominently before the association for several years, and a clearer definition of policy. Among these were the relations of the State and Federal agencies, and the attitude of each toward extension enterprises, both matters of the highest import at the present time.

The keynote of the convention was a closer relationship and understanding between the agricultural colleges and the experiment stations on the one hand and the Federal Department of Agriculture on the other. These are the great recognized agencies for the advancement of agriculture in the United States. They are bound together by a common constituency, a common purpose, and in many respects a common method; and they are alike supported by public funds in which the General Government is a large contributor. Together they constitute an unparalleled system for agricultural development and the enlightenment of agricultural people. There is every reason in logic and economy and efficiency of effort why they should occupy the closest relationship and work together or independently, as the case may be, with the fullest sympathy and understanding. The Secretary of Agriculture is anxious that this condition should speedily prevail, and his advances have been cordially reciprocated by the executive committee of the association, as the representatives of the colleges and stations.

Naturally, therefore, the subject held a prominent place on the program of the convention. Its discussion was characterized by commendable frankness and good spirit, and the desire for mutual understanding. A basis for the consideration was furnished by the tentative suggestions agreed to by the executive committee of the association after conference with the Secretary of Agriculture last summer, which were printed in the program of the meeting. These suggestions related to the respective fields of the state and federal institutions, plans for cooperation and correlation, for intercourse through committees, and the conduct of extension work.

In his address at the opening of the convention the Secretary of Agriculture expressed a frank realization that conditions have not been what they should be, that there has been to some extent a dispersion of agricultural agencies within the States, and that the federal and state agencies "have not always worked with a unity of purpose and a oneness of mind." Without minimizing the difficulties of correcting this condition, the Secretary expressed the belief that the present time is a peculiarly favorable one for the better coordination of agricultural activities in the United States, and declared that "certainly anything that reasonable human beings can do to harmonize and coordinate the activities of the several agencies which are serving the same people should be done. . . . In my judgment it can be done and should be done by the unselfish men directing the several institutions of the States and of the Nation," without compulsion of law.

It is significant of the progress of the times that, as Secretary Houston pointed out, both the Department and the agricultural colleges have felt the responsibility of getting the results of investigation and experiment before the farmers promptly and effectively. "Both sorts of agencies, federal and state alike, have information which must be taken to the farmers. It would be idle to spend millions of dollars to secure information and then to conceal it." In this matter the Department and the colleges are attempting to educate the same people, but in doing so there is danger of confusion and waste of effort unless there is coordination. The Secretary declared emphatically that "the Department has no selfish institutional ambition. . . . To the extent to which the States efficiently undertake their tasks they will minimize the necessity for the operation of the Federal Department of Agriculture." He voiced the conviction that the agricultural colleges are the agencies which must primarily deal with the individual farmer in the matter of education, and that what the Department does in the direction of getting its information before the people should be through cooperation with the several state agencies. This position is in accord with his previously expressed

opinion that "the State is the smallest unit with which the Federal Government should be required to deal."

This view was confirmed and elaborated by the Assistant Secretary of Agriculture, Dr. Galloway, who recognized that although the Federal Government has been in better position to secure appropriations than the States, the latter "are or should be in closer contact or sympathy with the farmers within their respective borders, and should be helped in every way to hold this sympathy and support." He added that "the problem is to bring about close and cordial relations, to strive at all times to keep the fields of endeavor defined through personal contact and mutual understandings on the part of the workers, and to gradually develop a spirit of sympathy and helpfulness through actual constructive effort rather than through theoretic and academic discussions." This expresses clearly the program which both parties are united upon as highly desirable and are endeavoring to carry out.

In relation to extension work, the principles were laid down, "(a) that the land-grant college is the institution within the State best equipped to handle the work; (b) that all work grouped under the general term of extension service, whether federal or state, should be handled through such colleges; (c) that when federal funds are involved the work should be projected on purely cooperative lines with leadership centered in the college." More recently in hearings on the Lever bill it has been explained that the demonstration work now being conducted by the Department will be conducted through the colleges, and that other phases of extension service that may be developed will be handled in the same way.

"It is self-evident that no action should be taken by the Federal Government leading to centralization of power and domination of work. It is also self-evident that if the Federal Government appropriates money for work within the States it must assume a certain amount of responsibility for the expenditure of this money to the Congress and to the people of the United States."

The principles involved in the extension measures now before Congress are considered mainly those of cooperation, the Federal Government aiding by advice and assistance in coordinating effort, and the responsibility for the actual conduct of the work being placed in the agricultural college.

Research is a fundamental and vitalizing function of the Department and of the experiment stations alike; the States by virtue of federal and state authority, are empowered to do practically the same things the Department is authorized to do in this field. This is a fortunate recognition by both the state and the federal governments of the comparatively modern view of research as all-essential to the future progress of agriculture. The field is so extensive, the

problems so numerous and intricate, and the present training so inadequate that little more than a beginning has yet been made; but to avoid confusion a division of effort was advocated, a close working together, and an exchange of projects for mutual information. Dr. Galloway conceived that the Federal Department should concern itself with the broader regional problems in research, the States in general with the more restricted or local problems, and the colleges should be given an open field to develop an investigational atmosphere and to train research men.

Dean Davenport, of Illinois, speaking from the standpoint of the state institutions, agreed with this general proposition, but thought that both the Department and the state institutions should be left quite free to work in large measure independently in their respective fields, and that great care should be taken to put their cooperative activities, as far as such activities are undertaken, on a natural and rational basis.

As a prerequisite to the more intimate relationship and adjustment outlined, a modification of the Department's organization is regarded as essential by its administrative officers. The building up of rigid bureau lines in the Department has developed a lack of elasticity and of power to coordinate its enterprises and arrange for cooperation; and this has been emphasized by the rapid expansion of the regulatory functions, which have made inroads on the time of workers, given them new affiliations and outlook, and tended to develop an individualistic point of view. These additional regulatory functions and the increasing demand for various phases of extension work have, as Dr. Galloway pointed out, "made it difficult to bring about centralization of effort in a number of fields, and thus the bureaus have been left to work out their own plans, each without very much regard to what the other is doing, and I might say to what the country is doing. To this condition, which is patent to everyone who is familiar with the Department, is due many of the difficulties we have experienced in the past in the matter of establishing and maintaining proper relations with state workers."

This situation was recognized in part in the address of Dean Davenport, who in referring to the present organization of the Department characterized it as being primarily for administration rather than for research. "For this reason," he said, "it succeeds best in those lines that are administrative, such as weather and inspection service. For this reason too it drifts more naturally into demonstration than into investigation," although "a whole rich domain requiring large funds awaits development by methods that are in general too costly for the state institutions to undertake."

To remedy the situation an organization based on the character of service rendered has been outlined, to take the place of the existing bureau organization. This as at present contemplated would include some six main groups, such as a research service, a rural organization service, a state relations service, a weather service, a forest service, and a regulatory service.

The research service would embrace the experimental and investigational activities of the Department in the direction of acquiring new knowledge, and such agricultural surveys as are conducted. The various phases of research would naturally be headed by leaders, and the elimination of regulatory functions or extension activities and other conflicting functions would give opportunity for concentration upon research problems, their definition, organization, and solution.

The rural organization service would deal with questions of organization for social purposes, for production, and for marketing or purchasing, rural finance and credits, land tenures, labor, farm management and home management, public roads, agricultural forecasts and estimates of crop production.

The state relations service would constitute the special agency for extending and broadening the relations of the Department with the agricultural colleges, experiment stations, and other state institutions doing agricultural work. This, it was suggested, should include an exchange of project plans, the organization of committees, and team work generally. The supervision of the funds given to the States for experiment stations and the advisory relations with these institutions would be included in this service, as would also matters relating to extension work.

The weather service would remain practically as it is at present except that the agricultural climatological work would be grouped under the research service. The forest service would be an administrative organization charged with the maintenance, protection, and management of the national forests, including questions involved in the acquisition of lands and the protection of navigable streams.

Under the regulatory service would be grouped the various duties now scattered throughout the Department having to do with the enforcement of the food and drugs act, the meat inspection laws, and the insecticide and fungicide act, the handling of serums and viruses, plants and seeds, animal and plant quarantine, the inspection of export animals, game protection, grain and cotton standardization, and similar matters.

The fundamental idea of the new plan of organization, as Dr. Galloway explained, is coordination, the grouping of activities according to objects rather than according to methods, and the encouragement

of team work both within and without the Department. The plan of reorganization has since been briefly outlined in the Report of the Secretary of Agriculture, and the authority of Congress asked in carrying it into effect.

The intelligent planning of the work of the Department and the stations so as to avoid overlapping and duplication of effort will involve a mutual understanding of the purposes and plans of each. As Secretary Houston said, the Department plans its work in advance on the project basis, and secures its appropriations therefor from Congress. One of the difficulties of planning in the past has been that the Department has not known what the States were doing or had in mind, and vice versa.

The proposal in the case of the extension work is that definite projects shall be thought out, coordinated, and mutually agreed upon before the money is expended. In the case of the station work under the Adams fund this procedure is now followed. The belief was expressed that the careful devising of projects to cover all of the activities and making them known through some sort of clearing house will eliminate unnecessary duplication, waste, and friction. The advantages of the project system in securing well-considered plans, adjusting relations, and facilitating cooperation and continuation of work, as well as for administrative purposes, are generally admitted. The proposal of the Secretary of Agriculture for an exchange of projects between the Department and the stations, through the agency of a joint committee on projects, has received the unqualified approval of the executive committee of the association.

In addition to a project committee, Dr. Galloway enumerated two others, one on relations of the Department and the college and stations, in accordance with suggestions at a previous conference, and another on the publication of research. Each would be a joint committee, composed of representatives from the colleges and stations and the Department.

The committee on relations would meet several times a year with the Secretary of Agriculture and discuss the broader questions of relationship. It would be empowered to arrange for meetings of related workers in the respective institutions to discuss their lines of work and arrange questions of cooperation through mutual understanding. Such meetings were cordially endorsed by the executive committee of the association.

The committee on projects would function in an advisory way in the development of a plan for unity of action in project statements, so far as these relate to research and extension service, and would be charged with bringing together the projects of all the institutions involved and arranging for a system of exchanging projects. It

might be able to promote cooperation and correlation in important lines of research requiring that the subject be approached from different standpoints or aspects.

The committee on publication of research would be an enlargement of the present editorial committee on the *Journal of Agricultural Research*, the additional members representing the agricultural colleges and experiment stations on this publication.

Provision for these three committees was made by the association, the executive committee being designated to act as its committee on relations. The retiring president of the association has designated Prof. Alva Agee of New Jersey, Dean A. F. Woods of Minnesota, and Dean F. B. Mumford of Missouri, to represent it on the project committee; and Dr. H. P. Armsby of Pennsylvania, Dr. Raymond Pearl of Maine, and Prof. L. R. Jones of Wisconsin, on the committee on publication of research.

It will be recognized, therefore, that a very important step in advance has been taken, which will be viewed with much gratification from all sides. The arrangements which have been made are full of promise for a more harmonious and mutually helpful relation between these agencies. Already confidence and expectation have been established, and the Department has explained with much frankness its plans for reorganization to meet the desired ends. As Dr. Galloway stated, the laying down of principles is comparatively simple and easy, while the working out of plans for making them effective is far more difficult. Changes can not be made all at once but must be a matter of evolution. Hence the condition calls for the exercise of patience and the recognition of the intent which has been so plainly set forth in the recent negotiations.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The physics and chemistry of colloids, E. HATSCHEK (*Chem. World*, 1 (1912), Nos. 1, pp. 22, 23, fig. 1; 2, pp. 54-56; 3, pp. 90-92; 4, pp. 135-137; 5, pp. 170, 171; 6, pp. 208, 209; 7, pp. 243, 244; 8, pp. 283, 284; 9, pp. 313, 314, figs. 2; 10, pp. 346-348, fig. 1; 11, pp. 391, 392, fig. 1; 12, pp. 427, 428).—A detailed exposition of the physics and chemistry of the colloids.

Modifications in the properties of the proteins of gliadin, A. J. J. VANDELDE (*Abs. in Bul. Soc. Chim. Belg.*, 26 (1912), No. 1, pp. 14, 15).—Continuing previous work (E. S. R., 27, p. 107), it is shown that if mixtures of wheat flour containing either sodium chlorid, sodium sulphate, magnesium sulphate, ammonium sulphate, tartaric acid, citric acid, oxalic acid, or tannin are made, the elasticity of the gliadin seems to be lost. This is probably due to the transformation of the gliadin into a nonelastic protein.

In a dry mixture of wheat flour and casein the amount of gliadin that may be extracted by kneading remains constant even after 1 month.

If to the mixture water is added, the gliadin constantly increases, providing the mixture is allowed to stand 24 hours before kneading. The same effect, but in a less accentuated form, is produced when Witte peptone or egg white is added to the flour.

With the usual methods for gliadin in which alcohol is used, more gliadin is obtained when salt is present in the flour. Flour deprived of its water in a vacuum desiccator shows a constant amount of gliadin.

Pectins of aucuba and sweet orange, V. HARLAY (*Jour. Pharm. et Chim.*, 7 ser., 5 (1912), No. 7, pp. 344-347; *abs in Jour. Chem. Soc. [London]*, 102 (1912), No. 595, II, p. 479).—The pectins isolated from aucuba fruits and sweet orange fruit rinds are described.

"The dry ground pulp of aucuba fruits was extracted with boiling water and the extract precipitated with alcohol. The precipitate was purified by (1) boiling with alcohol (90°) and (2) solution in water filtration, and reprecipitation with alcohol containing hydrochloric acid. It was then a brownish-white powder, containing 6.86 per cent water and 1.8 per cent ash, was soluble in water, did not reduce Fehling's solution, and was precipitated from its aqueous solution by limewater, baryta water, or copper sulphate solution. It had $[\alpha]_D + 217.3^\circ$ (corr.) in water, and by Tollens' method yielded mucic acid, derived from galactan.

"The white portion of sweet orange peel was freed from hesperidin by extraction with alcohol, and the pectin was then isolated by the method described above. It formed a white powder, giving an opalescent solution in water, which was precipitated by the agents mentioned above. It had $[\alpha]_D + 176.6^\circ$ (corr.) in chloral hydrate solution, and on hydrolysis by dilute sulphuric acid gave arabinose and with nitric acid gave mucic acid, the latter derived from galactan."

Takadiastase, J. WOHLGEMUTH (*Biochem. Ztschr.*, 39 (1912), No. 3-4, pp. 324-338; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 595, I, p. 402).—The amylase of takadiastase required a stronger concentration of acid to produce a corresponding inhibition of its action upon starch than did the amylase contained in the saliva. Like other amylases, it is sensitive to alkalis, but less so than salivary amylase. The amylolytic action of takadiastase was stimulated by the presence of salts in a concentration of tenth-normal, but not by lower concentrations. Takadiastase also possesses marked coagulating, chymosin-like, lypolytic, and tryptic powers, but no peptolytic power. It also contains an adrenalase.

A color reaction of ammonia, P. THOMAS (*Bul. Soc. Chim. France*, 4. ser., 11 (1912), No. 15, pp. 796-799; *abs. in Jour. Soc. Chem. Indus.*, 31 (1912), No. 16, p. 771).—The reaction studied was first noted by Berthelot in 1859, and may be used as a quantitative method in the following form: "Into a series of test tubes are measured known quantities, 5 cc. down to 0.1 cc. of a 1 in 10,000 solution of ammonium chlorid, the volumes made up to 5 cc., then 1 cc. of a 4 per cent solution of phenol added, and finally 1 cc. of a dilute solution of sodium hypochlorite. On mixing, a blue color develops. The solution in which the ammonia is to be estimated is treated in the same way, and the two colors compared. The sensitiveness is equal to that of the Nessler test. The reaction is also given strongly by glycocoll and some of the primary amins."

Notes in regard to the titration of phosphoric and boric acids, W. BILTZ and E. MARCUS (*Ztschr. Anorgan. Chem.*, 77 (1912), No. 1, pp. 131-136).—If phosphoric and boric acids are to be determined in the same solution and in the presence of magnesium chlorid, the solution must first be neutralized against methyl orange and titrated with a decinormal solution of sodium hydroxid, using phenolphthalein as the indicator. Mannitol is then added and the solution again titrated with sodium hydrate solution, this last titration representing the boric acid.

Another method consists in making the solution neutral against phenolphthalein as before, then adding mannitol, and titrating with sodium hydroxid. Both acids thus titrated behave as monobasic acids. The titration can also be made in the presence of calcium chlorid, but allowance must be made for the tertiary calcium salt produced which acts as a tribasic acid.

Gerhardt's statement that free phosphoric acid remains in solution when shaken with calcium carbonate is contradicted.

Determination of potassium, especially in fertilizers, soil extracts, and plant ashes, W. A. DAVIS (*Jour. Agr. Sci. [England]*, 5 (1912), No. 1, pp. 52-66; *abs. in Jour. Soc. Chem. Indus.*, 31 (1912), No. 21, p. 1045).—The perchlorate method is considered simpler and more exact than the platinic chlorid method.

"An improvement consists in washing the precipitate of potassium perchlorate with 95 per cent alcohol saturated at the temperature of working with potassium perchlorate. This allows thorough washing and obviates any error due to the solubility of the precipitate. The economy of the new method is a very real advantage. The presence of barium, magnesium, and calcium chlorids and sodium phosphate is without prejudice and these salts need not be removed. With a sufficient excess of perchloric acid, potassium sulphate can be estimated directly without conversion into chlorid; alternatively when the sulphate is converted into chlorid by the Stassfurt method, the exact precipitation of the sulphate is not imperative. The method also avoids the uncertainty attaching to the atomic weight of platinum."

Estimation of lime in plant ashes, P. L. GILE and C. N. AGETON (*Porto Rico Sta. Rpt.* 1912, pp. 21, 22).—In connection with investigations on the effects of

strongly calcareous soils on the composition of the ash of 7 samples of cassava roots and stems, a comparison was made of the acetate method for estimating calcium and the official method. The former method consists of precipitating the iron and aluminum present as phosphates with ammonium acetate in a slightly acid solution and then precipitating the calcium as oxalate, thereby avoiding the reprecipitation of a bulky precipitate of ferric phosphate. In the acetate method the ferric phosphate precipitate is small, is easily handled, and does not have to be reprecipitated.

It was found "that the acetate method is fully as accurate as the official method for the determination of lime and magnesia in plant ashes. Since these samples contained from 15 to 18 per cent of P_2O_5 and only 0.63 to 1.72 per cent of Fe_2O_3 , it is evident that only a small portion of the phosphoric acid was removed before the precipitation of lime in the acetate method, and that the further addition of ferric chlorid, with its attendant difficulties, as prescribed by the official method, is unnecessary."

Apparatus for the detection of carbon monoxid, M. A. GUASCO (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 4, pp. 282-284; *abs. in Analyst*, 37 (1912), No. 438, p. 426).—With the apparatus described as little as 1 part carbon monoxid in 10,000 may be detected.

"Two bulbs, one of which is platinized, are carried at the extremities of a vertical U-tube, and are inclosed in a gas-tight envelope, to which the gas to be examined is admitted through a porous septum. The portion of the U-tube outside the envelope contains a colored liquid, and is so arranged that very small differences of level, produced by differences in temperature of the bulbs due to occlusion of inflammable gases by the platinum, are readily observed. With the apparatus used, the difference in the levels in the two limbs produced by 1 volume of carbon monoxid per 1,000 was 13 mm., and by 2 in 1,000, 26 mm. . . . If mercury is substituted for the colored liquid, the apparatus can readily be arranged to close a circuit and thus release an alarm signal."

The determination of nitrates in soils and soil extracts, H. H. HILL (*Virginia Sta. Rpts. 1911-12*, pp. 133-144).—The zinc-iron reduction method, the Tiemann-Schulze method, and the colorimetric method were compared.

The results show that "in pure solutions of potassium nitrate each one of the 3 methods tried gave excellent results through 9 mg. of nitrate nitrogen calculated as N; but beginning at 10 mg. and continuing through 40 mg., only 2—the reduction and Tiemann-Schulze methods—gave satisfactory results. The results obtained in using pure nitrate solutions were found to be true when soils to which nitrates had been added were examined. It is probably better to use the colorimeter method for all quantities of nitrate nitrogen not over 9 mg., this method being very rapid, and also making very expensive reagents and apparatus unnecessary. From 10 mg. of nitrogen to 40, the reduction and Tiemann-Schulze methods are the most accurate.

"Organic matter has a marked effect upon the Tiemann-Schulze method. This is especially true of the carbohydrates. When soils contain amounts larger than those usually found in our eastern soils, especially those of Virginia, or soils which have received a green manure, it is best to use a modification of this method to correct the error due to the presence of organic bodies. Virginia soils are very deficient in nitrates, the average amount in every 100 gm. of dry soil being about 1 mg. The colorimetric method gave excellent results on these soils, and it is thought expedient to use this method whenever possible. There is very little variation in the reading of the colorimeter by different observers when freshly prepared standards and a reliable colorimeter are used."

A bibliography is appended.

Estimation of cacao shells in cocoa powders, LOUISE KALUSKY (*Ztschr. Untersuch. Nahr. u. Genussmittel*, 23 (1912), No. 12, pp. 654-661).—This method is based on the difference in specific gravity noted between the outer and inner coats of the bean. It was found that the 2 tissues when present in a mixture could be separated by means of a mixture consisting of chloral hydrate, glycerol, and water. The specific gravity of the inner portion, after the removal of the fat and treatment with diastase and later with hydrochloric acid, was found to vary between 1.1131 and 1.3503. In most instances, however, it was less than 1.25. The specific gravity of the husk on the other hand lies between 1.234 and 1.9337. The inner portion of the bean of commercial cocoa powders had a higher specific gravity than the products prepared by the author.

Bacteriological and chemical methods for determining the quality of milk, E. B. FRED and G. W. CHAPPELEAR, Jr. (*Virginia Sta. Rpts. 1911-12*, pp. 206-239, figs. 4).—As the plate bacterial count method fails to show the type of organism present in milk, requires too long a time to execute, fails to give a true index of the actual number of organisms present, and finally necessitates an expensive equipment and skill, it can not be adapted to general usage. In these experiments the value of the reduction test in comparison with the plate, acid, fermentation, sediment, and catalase tests was studied. For the work with whole milk, which was obtained from the city of Roanoke, Va., and the creamery of the Virginia Polytechnic Institute, beef peptone agar was used as the nutrient medium for the plate and similar work, as it was found to give the best results. For the experiments with pure cultures in some instances beef peptone agar was employed, but for the *Streptococcus lacticus* and *Bacterium lactis acidii* milk whey agar was used.

In the stain-reducing experiments much was found to depend upon the kind of stain used. The pure stain usually employed for medical purposes was found the most applicable. In all probability the controlling factor in stain reduction by micro-organisms is the toxic properties of the dye rather than the difficulty encountered in reduction by chemical means. Iodin green, methyl violet, gentian violet, and safranin were not reduced, and in the final experiments methylene blue, litmus, indigo carmin, and neutral red were used. The stains were also titrated against a solution of titanium trichlorid, and neutral red was found not to be reduced by this reagent.

For the reduction test a methylene blue solution consisting of 1 gm. of pure methylene blue in 1,000 cc. of physiological salt solution, diluted with an equal volume of water, was found to be best suited. Next came litmus, while neutral red and indigo carmin were found to be quite toxic. The temperature influences the time of reduction. "The various organisms have different powers of reduction which vary widely among themselves, and, as a rule, the lactic acid organisms reduce first; then follows *B. vulgatus*, *B. aerogenes*, *B. denitrificans*, *B. coli communis*, and *B. vulgaris*, all of which are strong reducers." "In pure cultures time of reduction and growth of cells show a strong relationship and this relationship takes the form of an inverse proportion. As the number of cells approaches infinity the time of the reduction approaches zero, and vice versa."

From the experiments with whole milk it is noted that the percentage of acid in a general way has some relation to the number of micro-organisms present in the milk, but the reliability is an uncertain quantity and consequently the acid test is of little practical value. "[The fermentation test] is an easy test for finding out to a certain degree the type of flora present in milk. A comparison of the sediment and fermentation tests shows that a high dirt content is usually associated with a gaseous curd. Its relation to the other test is slight. Of the several methods studied, it proves the best criterion for determin-

ing the type of flora. The sediment test is useful in that it shows the care or lack of care used in handling the milk. . . . As a rule the amount of gas evolved by [the catalase test] is to a certain degree proportional to the number of bacteria present. In this respect, however, it does not seem to be any more efficient than the acid test. With cream the readings were much higher than with whole milk. Its value as a means for determining the keeping quality of milk is small."

By comparing the reduction test and the number of cells present in 199 samples of whole milk, a coefficient of 0.7 with a probable error of about 0.04 was obtained, which shows that these 2 factors are strongly related in inverse proportion. The reduction test is considered a better test for judging the quality of milk than the sediment, catalase, or acid test. It is recommended as a method to be used by the dairyman for judging the quality of milk on account of the small amount of apparatus it requires and the ease and rapidity with which it can be performed. "It is not so apt to be lost as is the case with the plate counts because of the spreaders and improper dilution. In a few hours with milk that has been kept for some time, about 1 to 3 hours, results can be obtained that would require at least 2 days with the plate counts." A combination of the reduction and fermentation tests is recommended, and for the latter a modified method for judging the curd is presented.

The detection of improperly heated milk, J. DROST (*Molk. Ztg.* [*Hildesheim*], 26 (1912), Nos. 53, pp. 995-997; 54, pp. 1009-1011).—The main purpose of this work was to determine whether a milk heated within 1 minute up to 85° C. was still capable of giving the guaiac and paraphenyldiamin reaction. The work had particular reference to pasteurizing milk on a commercial scale, but was done in the laboratory.

The milk heated from 70 to 75° gave a reaction with both reagents, while that heated to 80° or over rarely gave one. The samples heated to 75° slowly and cooled back to room temperature did not give the guaiac reaction even after standing for a long time, but gave the Storch reaction immediately.

Another series of tests in which the temperature was raised in from 23 to 28 minutes to 78½° gave traces of a reaction with the guaiac test and a slightly stronger one with paraphenyldiamin. In those cases where the author obtained reactions at 80° he believes that it was due to faulty technique.

Refraction of milk serum and the control of the milk supply, H. WITTE (*Ztschr. Öffentl. Chem.*, 18 (1912), No. 18, pp. 349-354).—The author believes that a milk containing less than 8.3 per cent of fat-free dry substance and a refraction less than 37.4 must always be viewed with suspicion.

Investigations in regard to milk biology with the anaphylactic method, H. HEUNER (*Untersuchungen zur Biologie der Milch mittels der anaphylaktischen Methode. Inaug. Diss., Univ. Giessen, 1911, pp. 33; Arch. Kinderheilk.*, 56 (1911), No. 4-6, pp. 358-386; *abs. in Zentbl. Expt. Med.*, 1 (1912), No. 7, p. 292).—It appears that casein, albumin, and globulin in milk and colostrum are to be considered separate antigens. Globulin and albumin seem to be more closely related than casein. Colostrum and milks coming from cows affected with mastitis show anaphylactic properties similar to those possessed by blood serum. All of these biological factors can be observed with the anaphylactic reaction, but it is not so specific as the reaction obtained with the complement fixation or precipitation test. By fractionating the various protein fractions or even the individual proteins an organic substance which is not anaphylactogenic can be isolated.

Bromin absorption of certain vegetable oils and fats, H. SPRINKMEYER and A. DIEDRICHS (*Ztschr. Untersuch. Nahr. u. Genussmitl.*, 23 (1912), No. 12, pp.

679-687; *abs. in Analyst*, 37 (1912), No. 438, p. 403).—"The following percentage quantities of insoluble bromin compounds were obtained on subjecting various oils and fats to the process described by Hehner and Mitchell: Linseed oil, 28.9; candlenut oil, 8.8; hempseed oil, 8.82; walnut oil, 2.22; soy-bean oil, 3.62; sesame oil, 0.14; mustard oil, 1.30; rape oil, 1.92. Poppy-seed oil, sunflower-seed oil, maize oil, cotton-seed oil, castor oil, tea oil, earthnut oil, coconut oil, palm oil, palm-kernel oil, cacao butter, stillingia tallow, tulucuna fat, dika fat, and malukang butter did not yield an insoluble bromin compound. In the case of shea butter, different specimens of the fat yielded from 5.2 to 5.6 per cent of bromin compound, while mowrah butter gave 0.82 per cent, enkabang tallow 0.17 per cent, and adjab fat 2.2 per cent. As regards the four last mentioned fats, the bromin compound appears to be formed from the unsaponifiable matters present, the fatty acids derived from the fats yielding no bromin compound after they have been freed from unsaponifiable matter."

A new oxygen absorption method for oils, L. P. WILSON and G. S. HEAVEN (*Jour. Soc. Chem. Indus.*, 31 (1912), No. 12, pp. 565-568; *abs. in Analyst*, 37 (1912), No. 438, p. 412).—The method is as follows:

About 0.2 gm. of the oil in question is mixed with 1 gm. of infusorial earth (kieselguhr) in a 250-cc. flask having a side neck. After cooling to a fixed temperature the side tube of the flask is sealed. The flask is then heated at 100° C. for 1 hour, cooled, and connected by means of the side tube to graduated levelling tubes filled with water. After noting the height of the water the seal is broken and the height read again. The difference between the 2 readings represents the oxygen absorbed by the oil, which is calculated to 100 parts of oil.

"The following percentage amounts of oxygen were absorbed by various oils examined: Linseed oil, 17.2 to 21.2; poppy-seed oil, 17.4; cotton-seed oil, 11.1; sesame oil, 5.8; olive oil, none."

Influence of peptones on the estimation of reducing sugars by Fehling's solution, A. BERNARDI (*Biochem. Ztschr.*, 41 (1912), No. 1-2, pp. 160-164; *abs. in Analyst*, 37 (1912), No. 437, p. 367).—"Although peptones do not reduce Fehling's solution, their presence in sugar solutions causes more cuprous oxid to be precipitated than is due to the reducing action of the sugar alone. In cases, therefore, where sugar has to be estimated in solutions containing peptones, the latter should be removed by means of phosphotungstic acid previous to the estimation of the sugar."

Rapid and accurate determination of traces of iron in cane and beet sugar factory and refinery products, J. J. EASTICK, J. P. OGILVIE, and J. H. LINFIELD (*Internat. Sugar Jour.*, 14 (1912), No. 164, pp. 428-435; *abs. in Jour. Soc. Chem. Indus.*, 31 (1912), No. 17, pp. 831, 832).—It is of the greatest importance to control the amount of iron in the material during the various stages of the process of manufacturing beet or cane sugar. For this purpose the authors recommend the colorimetric sulphid method, which is conducted as follows:

"A standard solution of iron is prepared by dissolving crystallized ferrous sulphate in distilled water, adding a few drops of sulphuric acid, and diluting, so that 1 cc.=0.00002 gm. of iron. In the case of light-colored products, 3 to 10 gm. of the sample is dissolved in water in a Nessler cylinder and made up to the 100 cc. mark. Into a series of Nessler cylinders are placed increasing amounts of the standard solution of iron, and the volumes in each are likewise completed to 100 cc. To each cylinder, 2 cc. of ammonium sulphid (freshly prepared) is added, the contents stirred, and allowed to stand for 10 minutes. Comparison of the test with the standard tubes then gives the iron content.

"If the sugar, massecuite, sirup, etc., be too dark, 3 to 10 gm. of the product must first be incinerated, using sulphuric acid, the ash being dissolved in the

smallest possible quantity of hydrochloric acid, and made up to 100, 200, or 500 cc., according to the amount of iron present, and the rest of the determination carried out as already described. It has also been observed as regards the preservation of the stock solution of iron that if instead of making the solution of the salt up to bulk with water, a 50 to 60 per cent solution of sucrose (refined sugar) be used, the titer will keep constant almost indefinitely. On making a series of comparative experiments with the sulphid, the thiocyanate, and the ferrocyanid methods, the authors find that the limit of accuracy, expressed in parts of iron per 100,000, is as follows: Sulphid, 0.05; thiocyanate, 0.1; and ferrocyanid, 0.25, and it was also noticeable that the maximum intensity of color is more rapidly reached in the sulphid method than in either of the other two. A number of determinations of the iron content by the sulphid method, using sirups (thick-juices), refinery heavy liquors, cane and beet sugars, and molasses, are recorded, and it is shown that except in the case of molasses and low-grade sugars, the result obtained by working with a solution of the product is identical with that found by operating upon the solution of the ash."

Precipitate produced by mercuric acetate from molasses; isolation of adenin, STOLTZENBERG (*Ztschr. Ver. Deut. Zuckerindus.*, 1912, No. 674, pp. 318-322; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 595, I, p. 397).—After clarifying molasses with lead acetate, the precipitate produced later by adding mercuric acetate was not found to contain any substances which have a high rotation in a neutral solution. Levorotatory substances were not noted, but when the precipitate was dissolved in hydrochloric acid, dextrorotatory bodies were detected. The mercuric acetate precipitate contains at least two acids and bases but no aspartic acid. The chief product noted was adenin.

The grinding of spruce for mechanical pulp, J. H. THICKENS (*U. S. Dept. Agr., Forest Serv. Bul.* 127, pp. 54, pls. 7, figs. 19).—Experiments at Wausaw, Wis., in cooperation with the American Pulp and Paper Association and the University of Wisconsin, are reported with spruce, as a standard wood, for the purpose of studying the influence which the variable factors such as (1) power applied to the grinder, (2) amount of pulp produced in 24 hours, (3) power consumption per ton of pulp in 24 hours, and (4) yield of pulp and screenings per cord of wood ground, have on the quality and production of the pulp. The following general conclusions are drawn:

"(1) The power to grinder increases with speed and pressure of grinding and decreases with the degree of sharpness of stone. There is also a very slight increase in the power required with increase of temperature, other conditions remaining constant, while the thickness of stock in the grinder pit has almost no influence. With all other conditions similar the power to the grinder is less for steamed wood than for green or seasoned wood untreated.

"(2) The rate of production varies directly with pressure, speed, and degree of sharpness of the stone. Less pulp is obtained in 24 hours with seasoned wood than with green, and still less with steamed wood, all other conditions being the same. The temperature and thickness of stock in the grinder pit have little influence on the rate of production. Slightly less pulp is produced at low temperatures.

"(3) The horsepower consumption per ton, when untreated wood is ground, increases as the pressure decreases, according to a fairly definite law. It is lower on sharp stones than on dull ones and increases as the speed decreases. There is, however, not as much difference between the power consumption per ton at low speed and high speed as there is between power consumption at low pressure and high pressure. The power consumption is very little influenced by temperature, but it is slightly lower at high temperature. The power con-

sumption is higher for seasoned than for green wood, and higher for steamed wood than for either seasoned or green material ground under the same conditions.

"(4) The yield of pulp per cord is greater at high pressure than at low, and while this is true also of the screenings there is not as much fine material lost in white-water when high pressure is used. The yield is not greatly influenced by the surface of the stone, but it is slightly higher at high speed than at low. The yield is proportional to the bone-dry weight per cubic foot of wood.

"(5) The quality of pulp varies most with the surface of the stone, less with the pressure, and least with the speed. The weight per cubic foot and character of wood, especially the latter, influence quality to a marked extent. Temperature also has a marked influence. Pulp of greater strength is obtained at higher temperature; that produced at low temperature will take a better finish. Pulp of better color can be obtained from green wood than from seasoned, and stronger pulp can be obtained by cooking the wood prior to grinding. The quality of paper produced under exactly the same conditions, but made of pulp produced at different grinder pressures, varies directly with the grinder pressure and the horsepower consumption per ton of pulp. Mechanical pulp of greatest strength can be produced only by the use of a relatively large amount of power."

The occurrence of lactic acid in sisal, W. McGEORGE (*Jour. Amer. Chem. Soc.*, 34 (1912), No. 11, pp. 1625-1627).—Previously noted from another source (E. S. R., 27, p. 717).

METEOROLOGY—WATER.

Meteorology for the farm and weather forecasting, L. M. GRANDERYE (*Météorologie de l'Agriculteur et Prévision du Temps. Paris, 1913, pp. VIII+9-72, figs. 13*).—This is an elementary treatise dealing with some of the simpler meteorological facts and weather signs.

Evaporation conditions at Skokie Marsh, E. E. SHERFF (*Plant World, 16 (1913), No. 5, pp. 154-160, figs. 4*).—Observations made with Livingston porous cup atmometers at four different places in this marsh showed that "expressed in general terms, the evaporation rates were inversely proportionate to the hydrophytism of the station." This is attributed chiefly to the greater amount of atmospheric moisture and the tall rank vegetation where the station is hydrophytic. Evaporation studies made at different levels above the soil surface in a dense growth of *Phragmites communis* and among *Typha* showed a systematic increase in evaporation with rise in elevation. The evaporation at 198 cm. in the first case was 3 times that at the soil surface, and at 175 cm. in the second case 10 times that at the soil surface.

It is concluded that plants growing in proximity to each other, if vegetating in different atmospheric strata above the soil surface, are subject to widely different growth conditions.

Evaporation from water and soil surfaces in the Livermore Valley of California, T. W. ESPY (*Engin. and Contract.*, 39 (1913), Nos. 18, pp. 506-508, figs. 7; 19, pp. 523-526, figs. 8).—Observations are recorded which indicate that "(1) the evaporation from the area of the Livermore Valley formerly saturated and supporting a dense growth of tules, willows, and wild celery, etc., was at least 66 in. per annum, and that under the present crop conditions the evaporation over this area is at least that much per annum; (2) that over the area supporting salt grass and other wild grasses the evaporation is proportional to the depth of water table, being at least 52 in. when the water table is near the surface; (3) that the water loss by evaporation applicable to large water bodies in Alameda County averages 48 in. per annum, which in its application to the

gross draft should be reduced by that portion of the rainfall over the surface of the reservoir not included in the run-off."

Suggestions for frost protection, K. F. KELLERMAN (*Jour. Wash. Acad. Sci.*, 3 (1913), No. 3, pp. 53-55).—Three methods of utilizing water as a protection against frost are suggested: "(1) The atomizing, or spraying by the use of power sprays, of fine mists of water which might be warmed at a central station; (2) the suspension of pans holding small quantities of water above each of the fire pots now in use; and (3) the pumping, through a permanent system of pipes, of steam generated at a central station and mixed with large quantities of air to prevent condensation in the pipes." The theoretical possibilities of the first only are discussed.

It is estimated that using this method "for a body of air 26 ft. deep, covering 1 acre, 86.7 gal. of water at 194° F. would be necessary to raise the temperature from 30.2° to 32°, if the humidity was 80 per cent; 31.8 gal. more would be required to raise the temperature to 33.8°; 32.2 gal. additional for 35.6°; and 32.6 gal. additional for 37.4°. Probably much larger quantities would be necessary in actual practice, due to loss of heat by convection currents, by imperfect distribution of the water, and by the radiation continually taking place into the air outside of the heated zone."

Weather record, 1912, E. BURKE (*Montana Sta. Rpt. 1912*, p. 87).—This is a tabulated monthly summary of observations at Bozeman, Mont., on temperature, precipitation, cloudiness, and wind. The highest temperature recorded during the year was 87° F., July 25 and August 25, the lowest -19°, January 2. The total precipitation for the year was 21.65 in. The last killing frost in the spring occurred May 28. The first killing frost in autumn occurred September 15.

Report of the consulting meteorologist, J. F. VOORHEES (*Tennessee Sta. Rpt. 1911*, pp. 183-187, figs. 7).—The rainfall of Tennessee in 1911 is compared with the normal rainfall of the State and discussed in relation to crop production. It is stated that "the average rainfall for this State is ample for six times the average crop produced" if properly utilized.

Report of the consulting meteorologist, J. F. VOORHEES (*Tennessee Sta. Rpt. 1912*, pp. 66-68, figs. 5).—A chart showing rainfall distribution in Tennessee during 1912 is given and discussed with reference to the double cropping system. The relation of weather conditions to the growth and maturity of soy beans is also briefly discussed, it being pointed out "that the length of time required for maturing this crop was materially shortened by increase of temperature."

Meteorological data, January 1, 1910, to December 31, 1912 (*Virginia Sta. Rpts. 1911-12*, pp. 253, 259).—Tables are given showing monthly summaries of observations at Blacksburg, Va., on temperature, precipitation, wind, and cloudiness.

Water supply of the District of Columbia and water power at Great Falls, W. C. LANGFITT ET AL. (*U. S. House Representatives*, 62. Cong., 3. Sess., Doc. 1400, p. 153, pls. 64).—This document reports an examination of the water supply of the District of Columbia and the availability of the water power at Great Falls, Potomac River, for supplying light and power.

Water power of [rivers of the northern half of] Indiana, W. M. TUCKER (*Ind. Dept. Geol. and Nat. Resources Ann. Rpt.*, 36 (1911), pp. 469-538, figs. 8).—An attempt is made to give a general view, based upon surveys and measurement, of the water power conditions and possibilities of the streams and their tributaries in northern Indiana. The water power of this area is considered to be much more valuable than that of the southern part of the State, due to

the natural storage afforded by the numerous lakes and swamps and by the deep deposits of glacial sand and gravel, although climatic conditions are slightly less favorable.

Chemical and biological survey of the waters of Illinois (*Univ. Ill. Bul.*, 9 (1912), No. 20, pp. 173, figs. 19).—This contains a brief general report concerning water survey bills, the reorganization of the state water survey, and the work of the laboratory and engineering divisions, reports of the Illinois Society of Engineers and Surveyors, sanitary district of Chicago, Lake Michigan Water Commission, Illinois Water Supply Association, and Rivers and Lakes Commission, and the following special articles: Composition of insoluble gases formed by the decomposition of organic matter, opinions relative to principles governing stream pollution, determination of ammonia nitrogen in water, extent and composition of the incrustation on some filter sands, composition of sediment found in water from deep drift wells, sanitary survey of the Lake Michigan watershed in Illinois, experiments in the removal of iron from the water supply of the University of Illinois, removal of iron from a drift well water, typhoid fever epidemic at Rock Island, sanitary survey of the Vermilion River, report on the pollution of the Fox River at Geneva, and sanitary survey of the Fox River Valley.

The mineral content of Illinois waters, E. BARTOW, J. A. UDDEN, S. W. PARR, and G. T. PALMER (*Ill. Geol. Survey Bul.* 10, 1909, pp. VIII+192, figs. 10).—This is a preliminary report "designed to place in the hands of the citizens of the State accurate analyses of water from the different geological horizons and geographical districts." Following the geological classifications of the water of the State is a classification of mineral water according to physical and chemical properties.

Brief notes are given on boiler waters as regards scale formation, foaming, and corrosion, and on the medicinal springs of the State. It is stated that in general the waters of Illinois may be divided into two classes, containing either sodium carbonate or magnesium sulphate. The large majority of the waters are alkaline and analyses of many of them also indicate the possibility of corrosion when used in boilers.

Numerous tables of analyses are given.

The utilization of sewage, G. A. SOPER (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 10, pp. 860, 861).—This is a very brief discussion of the relative advantages of applying sewage directly to the land without treatment and of the extraction of the utilizable ingredients by means of mechanical devices.

Direct application of the sewage to the land is not considered a satisfactory method of disposal. "Sewage farming does not afford a satisfactory method of utilizing the useful ingredients of sewage, except under unusual circumstances, as, for example, where the contained water is needed for the crops.

"With respect to the extraction of the useful ingredients nothing favorable can be said. There are no works in the world which deal with sewage of average quality from which all or nearly all the theoretically useful ingredients are extracted without costing more money than they are worth."

Sewage purification at Atlanta, Ga. (*Municipal Engin.*, 45 (1913), No. 3, pp. 224-230, figs. 5).—This article summarizes the results of a six months' test of Imhoff tanks, dealing especially with the effectiveness of the purification and character of the sludge produced. Analyses are given of the sewage, effluent, and sludge. The nitrogen, which is the principal fertilizing constituent of the sludge, varied from 1.16 to 1.44 per cent.

SOILS—FERTILIZERS.

An investigation of soil temperature and some of the most important factors influencing it, G. J. Bouyoucos (*Michigan Sta. Tech. Bul.* 17, pp. 196, figs. 54).—This is the first report on a systematic study undertaken "to investigate, individually or in combination, many of the chief soil factors affecting the soil temperature; second, to study the effects of these various factors on the temperature of the soil under field conditions; and, third, to ascertain the relationship between soil temperature and the different meteorological elements." It is confined to "the results of the completed laboratory experiments and the results of only one year of the field experiments." The methods employed, many of them original, are described and the results obtained in the study of specific heat and heat conductivity of soils; effect of color on radiation and the radiating power of soils under different conditions or treatments; temperature of different types of soil; effect of organic matter on soil temperature; temperature of cultivated, uncultivated, and sod land; effect of soluble salts on the rise and fall of temperature of soils; and effect of decomposition of manure on soil temperature are presented in detail.

The method employed in the study of specific heat "was devised in the course of the investigation and was adopted in preference to a large number of others that were tried. This method consists in wrapping a definite weight of soil in a known weight of filter paper, tying the latter with a very fine thread, then suspending it in a beater at a temperature of about 97° C. After the soil had remained in the beater for 2 or more hours and had attained a constant temperature it was dropped at once into the calorimeter and stirred vigorously until the maximum temperature was indicated on the thermometer. This temperature was usually obtained in about one minute. . . . Both the free soil and the filter paper upon becoming wet increased the temperature, but this increase was deducted from the final calculation by ascertaining it in a separate experiment wherein was used the same amount of soil, filter paper, and water as in the regular determinations and having them at about the same temperature (25°)." The heat conductivity was measured under controlled laboratory conditions in cores of soil cut at different seasons of the year. The special apparatus devised for the purpose is described in detail.

Radiation was measured by means of a Beckmann thermometer in preference to a thermopile, the complete apparatus used (which was in part the same as that employed for measuring heat conductivity) being described in full.

It was found in general that "the specific heat of different types of soil, gravel, sand, loam, clay, and peat, in dry condition, did not differ very materially. This was true both by equal weights as well as by equal volumes. The specific heat of peat was about half as great as that given to it by other investigators. The moisture content of these different soils in their natural condition varied very greatly, and since water has such high specific heat it made a tremendous difference in their final specific heat.

"The heat transference in the different soils was measured (1) in their dry condition, (2) in their natural state under laboratory conditions, and (3) under field conditions. It was found in all these three states that the order of heat conductivity was the same. Gravel possessed the highest heat-transmitting power, followed in order by sand, clay, loam, and peat, respectively. Convective currents, molecular diffusion, and distillation influenced very greatly the rate of flow of heat, and consequently the values obtained do not represent the true heat-conducting power of these different types of soil.

"In field conditions the solar radiation tended to travel with greater rapidity and facility vertically than horizontally.

"The study on radiation showed that color had no effect upon radiation, which is contrary to the common belief, but it had upon absorption; that the different types of soil tended to radiate differently when dry, about the same and more when well moistened and in their natural condition, and that a dry surface or mulch reduced the radiation. In the dry state sand exhibited the highest radiating power, followed by gravel, clay, loam, and peat, respectively. The water, however, had by far the highest radiation capacity of any soil either in the dry or moist state.

"When the temperature of the different types of soil (all covered with a thin layer of the same kind of soil in order to eliminate the factor of color and other factors) was studied under field conditions, it was found that they all cooled and froze about the same time in the upper 6 in., but in the spring they thawed and warmed up at different rates. This was attributed to their different specific heats and to the downward and upward trend of air temperature in the fall and spring respectively. The gravel and sand thawed first, followed by clay 1 day later, loam 2 days later, and peat 10 days later. The temperature of the first two soils rose very rapidly after thawing, while that of the others rose very slowly. When the lower depths of the latter soils had thawed, however, their temperature rose also quite rapidly and finally reached the same degree of magnitude as in the former or lighter soils, and all continued to have almost the same temperature from then on throughout the summer, autumn, and winter.

"This equal degree of warmth of all the different types of soil during the warm part of the year and especially during the summer season was believed to be due largely to the thin layer of the same kind of soil with which they were all covered. This thin layer of soil tended to equalize the amount of heat that penetrated into these different kinds of soils by eliminating the differences of their color and by equalizing, to a large extent, the amount and rate of evaporation of their moisture. . . .

"Of all the different types of soil, sand showed the greatest amplitude and was followed by gravel, clay, loam, and peat, respectively. The greatest monthly fluctuation for all soils occurred in June and the least in February.

"The different meteorological elements played a great part in the temperature of the soils, but on account of the complexity of their behavior it was difficult to trace the direct influence of all of them. . . .

"The results from the investigation on the effect of organic matter on soil temperature showed that the rate of thawing was about proportional to the amount of organic matter present, but that after thawing the temperature of the soils containing 2.01, 3.32, 5.47, and 6.95 per cent organic matter was higher throughout the summer than the temperature of the white sand and of the peat. The temperature of these last two soils was about the same during the warmer part of the year, but during the cold seasons the peat had a higher temperature. The magnitude of the amplitude of all these soils behaved in the same order as the average temperature.

"The conditions of cultivation, noncultivation, and sod had a very distinct effect upon the soil temperature. During the winter all three plats had about the same temperature with a small difference in favor of the sod. In the spring the sod and uncultivated plats thawed first and the cultivated plat about one day later, at the 7-in. depth. The temperature of the sod plat rose several degrees above that of the other two plats and continued to be in excess until the plants had made a considerable growth, and then it dropped below that of the two bare plats, and remained so throughout the summer months, but when the cold period came the order was reversed, the temperature of the bare plats fell below that of the sod plat and continued to be lower

throughout the second winter. The temperature of the cultivated plat rose slightly higher than that of the uncultivated, after thawing, and continued to be slightly higher during the early part of the spring season or up to about the middle of May, and then the uncultivated plat become the warmer and remained so throughout the whole summer. During the fall both plats had about the same temperature with a slight difference in favor of the uncultivated plat. The difference in temperature between these two plats was explained upon the following general facts: (1) Different rate of evaporation, (2) different rate of heat conductivity, (3) difference in temperature at the lower depths, and (4) the effect of the dry mulch of the cultivated soil.

"Salt solutions had a very marked influence on the rising and lowering of soil temperature. Different salt solutions of the same density or the same solution of different densities raised the soil temperature considerably. Their influence was also very pronounced on the rate and degree of lowering of temperature, as well as on the rate of thawing.

"The different kinds of manure raised the soil temperature differently—horse manure the most, sheep manure the least, and the cow manure intermediate. In every case the greatest rise took place in the first three or four days. The rise increased with the increase in quantity. The degree of rise is probably insignificant for practical conditions."

A list of 41 references to literature on the subject is given.

Soil moisture, R. E. WILLARD and E. P. HUMBERT (*New Mexico Sta. Bul. 86, pp. 86, figs. 11*).—This bulletin gives the results of several years investigations on the movement of water in soils in field plats and in tanks. The field plats were one-twentieth of an acre in size. The tanks were of galvanized iron, approximately 27 in. in diameter and 4 ft. in depth. The tanks were sunk to their tops in galvanized iron jackets in the soil and were so arranged as to be readily withdrawn and weighed. Two lysimeter tanks were provided for studies on percolation and capillarity. These were similar in construction to those described except that they contained a false bottom, beneath which was a space capable of holding several gallons of water which could be drawn off and measured. "Two tanks 3 ft. in depth and 3 ft. square were provided for the purpose of determining the evaporation from the surface of water when it is in the direct sunlight and had the free passage of air over it, and also from the surface of water when the wind is not allowed to pass freely over it. The first of these is set so that the top is level with the surface of the ground, the second is similarly placed but is surrounded by glass so that the passage of air across its surface is prevented." Irrigation water in varying amounts was applied to the plats by the flooding and furrow methods.

It was found that while the soils experimented with "possess some capillary properties, these are apparently less than in more humid regions. The maximum rise from water through sandy loam soil was about 32 in. and through adobe clay 50.5 in. The movement of moisture from wet soil to dry was very slight although where a crop of wheat was growing moisture rose from wet soil below, to the region of the roots, through 30 in. of soil. This was the maximum observed.

"As other investigators have observed, the rise of moisture is more rapid in coarse soil than in fine-textured soils but the ultimate rise is much greater in the heavy soils. . . .

"Loss of irrigation water by seepage in these sandy loam soils was in proportion to the amount of water applied. When crops were grown on uniform sandy loam scarcely any of the irrigation water penetrated below 4 ft. from 20 in. of irrigation during the season as indicated from the tank data. Where the soil did not support a crop nearly one-seventh of the 20 in. was lost by seepage.

"In the natural soil in the field, however, the loss was greater, due to the presence of considerable gravel and sand. From 20 in. of irrigation more than one-third penetrated below 6 ft. The proportions were less where the applications were smaller.

"The rate of penetration in uniform sandy loam soil was about 5 ft. in from 15 to 20 days, it being more rapid during the first few days following irrigation and slower toward the end of the period. The more sandy and gravelly the soil the more rapid was the penetration. . . .

"The amount of water lost from the surface of an open tank is proportional to the amount of surface exposed. Protection from wind reduces the loss slightly. Also, the higher the temperature and the lower the humidity the greater is the evaporation loss, but these are factors over which we have no control."

Data are also reported as to the duty of water on wheat, corn, and soy beans.

The fixation of nitrogen in Colorado soils, W. P. HEADDEN (*Colorado Sta. Bul.* 186, pp. 3-47).—This bulletin contains data supplementing that previously reported (E. S. R., 25, p. 814), but dealing more particularly with the question of the origin and distribution of the nitrates occurring in excessive amounts in so-called niter spots in certain Colorado soils. The author asserts that ordinary Colorado soils "are not unusually rich in nitrogen. They are only moderately well supplied with it and the unusual amounts of nitrates found [in the niter spots] can not be produced by the nitrification of the supply already in the soil, but this supply must be supplemented by nitrogen from some other source." He is of the opinion "that this other source is the atmosphere." He believes that the nitric-nitrogen is not derived from the same sources as the ordinary white alkali and its high ratio of the nitric to total nitrogen in many of the soils, particularly in the surface portion of the niter spots, is "due to fixation and nitrification."

The deeper portions of the soil in these spots "are usually poor in nitrates but irrigation or rainfall may carry the nitrates on the surface downward, even into the ground water. While the solutions of potassic and sodic nitrates show capillary action, it is doubtful whether the calcic and magnesian nitrates do not move downward, especially in soils that are quite moist, rather than upward. The calcic and magnesian nitrates do not show capillary movement, exposed in glass vessels, as do sodic chlorid and nitrate, ammoniac chlorid, and many other salts.

"The solubility of the nitrates contributes to their easy and rapid removal by downward moving waters. The soil seems to have but little or no power to retain these salts, nitrates, so they pass readily into the drainage waters of the country, but the ground and drainage waters are rich in nitrates only when they come from niter areas. . . .

"The shales and sandstone do not furnish these nitrates or else all of the well waters would be rich in nitrates, but they are not richer in nitrates than well waters usually are. These well waters, both from ordinary and artesian wells, are usually quite rich in the so-called alkali salts, but not in nitrates." Moreover, the niter spots occur in sections where "shales and sandstones do not occur, and consequently can not be derived from them. . . . If the alkalis and nitrates have a common origin they should have a common distribution, but this is not the case even for very limited areas. If they owed their origin to leaching then the ground waters found beneath these lands should contain notable quantities of nitrates, but this is not true and the nitrates are localized in the brown spots."

A study of nitrification in certain types of Virginia soil, E. B. FRED (*Virginia Sta. Rpts.* 1911-12, pp. 174-201, figs. 3).—A study was made of the rate of

nitrate formation in five typical soils "to compare nitrification in these types kept in a greenhouse with a definite water content and, in the same types, when kept outdoors exposed to the usual temperature and rainfall; to measure the rate of nitrification in these same soils with 0.2 per cent of ammonium sulphate added; to note the effect of sand and lime on the accumulation of nitrates in clay soils; to study the nitrate-holding power of these soils in protected and unprotected series.

"All of the soil types tested show a marked nitrate-accumulating power when kept under glass. This gain is greater with certain soils than with others. The percentage of the total nitrogen converted into nitrates is unusually high.

"The rate of nitrification as measured by the conversion of ammonium sulphate into nitrate is different in the various types of soil. Here Appomattox Chocolate is first, and in the descending scale, Norfolk, Blacksburg, Albemarle, and Appomattox Light.

"Sand increases the rate of nitrate formation in the two types of clay soil used in this experiment.

"Applications of lime cause an enormous increase in the rate of nitrification. The total amount of nitrate formed during one year in these soils treated with lime is more than is possible from the ammonium sulphate alone.

"When nitrates are added in large quantities as sodium nitrate to protected soils there is almost no loss from denitrification, provided the moisture content does not exceed one-half total saturation capacity."

The use of forest humus in agriculture, P. EHRENBERG and F. BAHR (*In Festschrift zum siebenzigsten Geburtstage von Jacob Esser. Berlin, 1913, pp. 137-171; Jour. Landw., 61 (1913), No. 3, pp. 325-359*).—Pine and beech leaf mold was tested in fresh condition in pot experiments on sandy and loam soils with and without addition of lime and other fertilizer constituents.

The results showed that leaf mold was injurious to plants on soils poor in lime unless accompanied by applications of lime. The fertilizing value of the nitrogen of the raw pine leaf humus and even of the partially decomposed mold was very small, being only about 14 to 16 per cent of that of manure. The nitrogen of the beech leaf mold was slightly more efficient than that of the pine leaf mold. The beneficial effect of adding lime was thought to be due to improvement of the physical properties of the soil and not to its effect on the assimilation of nitrogen.

Report of the physiologist, O. LOEW (*Porto Rico Sta. Rpt. 1912, pp. 13-17*).—This deals principally with protozoan life and mineral nutrients in Porto Rican soils. The infusorium most frequently found was *Colpoda cucullus*. This was found "not only in moderately alkaline soils but even in very acid and stiff clay soils in which not a single other protozoan species could be detected."

A marked characteristic of tropical soils as distinguished from those of more northern climates is an intense red color "partly due to a higher degree of chemical disintegration, whereby the ferric silicates are further split into the brown ferric hydrate and silica, and the former is further changed to red ferric oxid, and partly to the frequent absence of humus, which would impart a dark color to the originally red soil. In some tropical countries the changes by disintegration go much farther and lead to the rather sterile laterite. The absence of humus forms a second characteristic of tropical soils." A third characteristic is the increased loss of lime caused by the rains at high temperature; in consequence of which there is an excess of magnesia over lime in the soils. A further characteristic is the unusually frequent acidity of soils.

It is suggested that anemia and other physiological disturbances frequently observed in Porto Rico are due in part to a deficiency of lime in the food products, especially rice, grown there.

Report of the chemist, P. L. GILE (*Porto Rico Sta. Rpt. 1912, pp. 18-22*).—A brief survey of the work of the year is given, with special reference to a study of the fertilizer requirements of a typical red sandy soil, analyses of which showed it to be strongly acid and deficient in all of the principal mineral constituents. A method of detecting lime in plant ashes is described (see p. 609).

Relation of calcareous soils to pineapple chlorosis, P. L. GILE (*Porto Rico Sta. Bul. 11, Spanish Ed., pp. 53, pls. 2*).—The English edition of this bulletin has already been noted (*E. S. R., 26, p. 121*).

Soil acidity and liming, A. R. WHITSON and W. W. WEIR (*Wisconsin Sta. Bul. 230, pp. 33, figs. 12*).—This is a somewhat popular presentation of results of investigations on this subject. It is shown that two-thirds of the soils of Wisconsin are acid and that these acid soils are usually deficient in available phosphorus. The acid soils are unfavorable to the growth of leguminous plants but respond profitably to applications of lime, which improves the growth of leguminous plants and thus increases the nitrogen supply of the soil. Special attention is called to the necessity of liming and inoculation for the successful growth of alfalfa on acid soils. The principal kinds of lime and the best methods of application are discussed.

The Illinois system of permanent fertility, C. G. HOPKINS (*Illinois Sta. Circ. 167, pp. 20, figs. 12*).—In this address before the Illinois State Farmers' Institute the author emphasized the great economic importance "of utilizing mineral plant food from the abundant natural supplies nearest at hand, such as Tennessee phosphate rock, Illinois limestone, and the potassium minerals already present in our normal soils," and of drawing the necessary supplies of nitrogen from the air by means of leguminous plants.

Shall we use "complete" commercial fertilizers in the corn belt? **C. G. HOPKINS** (*Illinois Sta. Circ. 165, 2. rev. ed., pp. 14; 3. rev. ed., pp. 18; 4. rev. ed., pp. 20, figs. 3*).—In this circular the author explains conditions under which the use of complete fertilizers may be very wasteful, and maintains "that in profitable systems of general farming nitrogen should be secured from the air, potassium should be liberated from the inexhaustible supply naturally contained in all normal corn-belt soils, and that phosphorus should be purchased and applied liberally in low-priced fine-ground natural rock phosphate, ground limestone (likewise a low-priced natural fertilizer) also being used where needed."

A study of the effect of fertilizers on the soluble plant food in the soil and on the crop yield, W. B. ELLETT, H. H. HILL, and S. M. HERRICK (*Virginia Sta. Rpts. 1911-12, pp. 116-132*).—This article summarizes the results of a five years' study of the effect of different kinds and combinations of fertilizers on the soluble plant food in the soil of field plats cropped continuously to corn, and of the possibility of correlating determinations of available plant food by chemical means with crop yields.

The results showed in brief that "fifth-normal nitric acid will detect phosphates when added to soils of limestone derivation and will show an increase in phosphoric acid the following year, notwithstanding the drain on the soluble phosphates by the crop." It was not possible, however, to make any correlation between plant food present, as measured by fifth-normal nitric acid, and the yield because of an increase in the soluble phosphoric acid. The available phosphoric acid of the soil as thus measured was not reduced by the cropping as much as the phosphoric acid content of the crop would indicate.

"By the use of commercial fertilizers there is an increase in the total plant food of the soil, as well as in the crop yield. The available phosphoric acid in the soil has been increased where complete fertilizers were applied, . . . notwithstanding the increase in yield on this plat.

"When phosphoric acid was applied to a limestone soil in the form of acid phosphate, which is soluble in water, it was not fixed in an insoluble form and its availability was not decreased in the five-year period. Similar results were secured where other forms of phosphoric acid were applied.

"The results indicate that the phosphoric acid applied was carried down to depths greater than 7 in. and later, by evaporation, concentrated in the upper layers of the soil.

"The application of lime alone did not show any consistent effect upon the solubility of phosphoric acid and potash.

"On this limestone soil the water-soluble phosphoric acid was found to be a more or less constant quantity and was not affected by applications of fertilizers or manures."

Nature of the changes in the solubility and availability of phosphorus in fermenting mixtures, W. E. TOTTINGHAM and C. HOFFMANN (*Wisconsin Sta. Research Bul. 29, pp. 273-321, figs. 3*).—This is a technical and detailed account of investigations which have been previously noted from another source (*E. S. R., 28, p. 815; 29, p. 23*).

Formation of nitrate from peat nitrogen, I. V. ĬAKUSHKIN (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscow), 19 (1913), No. 2, pp. 400-414, fig. 1*).—The investigations reported show that peat nitrogen has, to a fairly large extent, the capacity to form nitrates. Inoculation with cultures of *Bacillus mycoides* increased to an appreciable extent the formation of ammonia and subsequently of nitrate. In a peat rich in nitrogen, composted for nine months with a large quantity of lime with 75 per cent of moisture and at a temperature of about 25° C., 1.5 gm. of nitrate nitrogen per kilogram of air-dry material was obtained without the addition of ammonium salts. There was no loss of nitrate nitrogen when peat, which had been thus enriched in nitrate, was dried and left exposed to the air in dry condition.

The solvent action of ammonium salts on phosphorite in sand cultures, F. V. CHIRIKOV (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscow), 19 (1913), No. 2, pp. 241-249*).—The results of experiments with varying proportions of calcium nitrate and ammonium sulphate, here reported, show that the yield of barley was increased by replacing calcium nitrate with ammonium sulphate up to the point where one-half of the nitrate was so replaced. Beyond that point the yield declined. With lupines, however, the yield decreased with increase of the ammonium sulphate in the solution, due to the sensitiveness of the lupine to acid conditions. When ammonium sulphate was used alone and sufficient calcium carbonate added to secure complete neutralization, the yield of lupines was increased. Gramineæ utilized the phosphorite well when ammonium nitrate was present, but when a quantity of calcium carbonate equivalent to the acid of the nitrate was added the yield declined.

Superphosphates of different kinds in sand cultures, S. I. KALINKIN and I. V. ĬAKUSHKIN (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscow), 19 (1913), No. 2, pp. 233-240, figs. 3*).—In these experiments comparative tests were made of superphosphates prepared by the treatment of Russian phosphorites with bisulphate residue from powder manufacture and the acid wastes from the manufacture of nitro-toluene and the purification of naphtha. These phosphates were fully as assimilable and efficient as those prepared in the ordinary way.

The assimilation of metaphosphate and pyrophosphate by plants, B. M. ARNOLDI (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscow), 19 (1913), No. 2, pp. 252-255*).—Metaphosphate was well assimilated by oats and completely utilized by buckwheat in sand cultures. With pyrophosphate, however,

the oats gave better results (about equal to those with bone) than did buckwheat, which yielded much less than with bone.

Absorption of potash from zeolites by plants, F. V. CHIRIKOV (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou)*, 19 (1913), No. 2, pp. 300–309, fig. 1).—The zeolite used in these experiments was obtained by extracting sodium zeolite with potassium chlorid solution and contained 11.35 per cent of potash. The potash zeolite so obtained was used alone and with calcium carbonate and other necessary nutrient salts in pot experiments with barley. It was found that the potash of the zeolite was assimilable only when associated with other substances necessary for plant growth.

Vegetation experiments with potash minerals in 1911, S. I. KALINKIN (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou)*, 19 (1913), No. 2, pp. 287–293, fig. 1).—Biotite, nepheline, muscovite, and phonolite were tested as sources of potash for buckwheat, flax, and millet, and analyses of the buckwheat and flax indicated that they ranked in this order as to the assimilation of potash, showing that the potash of phonolite is difficultly assimilable by plants. The yield of barley to which glauconite sand had been applied was very low. It is suggested that this may have been due to the ferrous oxid in the glauconite.

Vegetation experiments with potash minerals in 1912, F. V. CHIRIKOV (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou)*, 19 (1913), No. 2, pp. 294–299, fig. 1).—Tests of phonolite and glauconite sand indicated a very low value for these materials as sources of potash. On the other hand, better results were obtained with biotite and nepheline than with potassium chlorid.

On the action of sodium salts in vegetation experiments, I. V. ĬAKUSHKIN (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou)*, 19 (1913), No. 2, pp. 315–337, figs. 5).—In sand cultures it was found that the order of tolerance toward sodium salts of the plants experimented with was as follows: *Panicum crus-galli*, *Triticum durum*, millet, *Medicago sativa*, and *T. spelta*. The sodium salts in certain cases promoted to a marked extent the growth of the plants. The addition of sodium chlorid, for example, increased the yield of Japanese millet (*P. crus-galli*) 52 per cent; that of sodium sulphate 68 per cent. The addition of the latter salt increased the yield of ordinary millet 23 per cent and of flax 27 per cent. The beneficial effect of the sodium salts was observed in a complete normal solution, thus indicating that the action of the sodium is not due to replacement of potash.

Gunpowder as fertilizer (*Invent. Age*, 25 (1913), No. 9, p. 9).—Experiments in which brown gunpowder, now no longer used in the navy, was successfully used as a fertilizer for garden vegetables are briefly reported. The powder, which contains about 80 per cent of potassium nitrate, was thoroughly wet and worked into the soil.

Fresh sludge and decomposed sludge, H. BACH and L. C. FRANK (*Engin. Rec.*, 68 (1913), No. 12, pp. 331–333, fig. 1).—Comparative studies were made of fresh and decomposed sludge from Imhoff tanks for the purpose of ascertaining the changes taking place in the tanks and the relative value of the sludges from the standpoint of utilization as a fertilizer, for recovery of fats, for production of illuminating gas, and for use as fuel.

The nitrogen, which is the only fertilizing constituent of the sludges reported, varied from 1.6 to 2.4 per cent in the fresh sludge from different tanks and from 1.5 to 2.3 per cent in corresponding decomposed sludge. There was in every case less nitrogen in the decomposed sludge than in the fresh sludge, but it was probably more available. The mechanical condition of the decomposed sludge was also more favorable for use as a fertilizer.

The fertilizing value of pond mud, P. KOSSOWITSCH (*Zentbl. Kunstdünger Indus.*, 18 (1913), No. 18, pp. 385, 386).—An analysis of the air-dry mud is

reported which shows 0.32 per cent of phosphoric acid, 0.29 per cent of potash, 3.12 per cent of lime, and 0.27 per cent of nitrogen. The composition of the mud was very similar to that of surrounding soil, although it was somewhat richer in calcium and magnesium carbonates and poorer in nitrogen. The phosphoric acid of the mud was also somewhat more soluble in citric acid than that of the soil, and the potash soluble in 10 per cent hydrochloric acid was double that of the soil. The analysis in general, however, does not indicate any high fertilizing value for the mud.

Commercial fertilizers, W. J. JONES, JR., ET AL. (*Indiana Sta. Bul.* 166, pp. 833-950, fig. 1).—This is a detailed report of inspection of fertilizers in Indiana during 1912 which included analyses of 1220 samples. The results show that the quality of fertilizers sold in 1912 was better than in any previous year. It is estimated that the consumption of fertilizers in the State in that year was 143,678 tons, valued at \$3,465,636.

Analyses of commercial fertilizers, B. L. HARTWELL ET AL. (*Rhode Island Sta. Insp. Bul.*, 1913, June, pp. 8).—This bulletin contains analyses and valuations of each fertilizer collected in the spring of 1913 in the brand name of which the word "potato" occurs, as well as of a few other brands used for potatoes and vegetables. It also contains the analyses of bones, fish, and tankage similarly collected.

The Missouri fertilizer law, F. B. MUMFORD (*Missouri Sta. Circ.* 58, pp. 185-188).—This is a reprint of the law approved March 14, 1903.

AGRICULTURAL BOTANY.

Twenty-five years of botany in Iowa, T. H. MACBRIDE (*Proc. Iowa Acad. Sci.*, 19 (1912), pp. 43-63).—This address on botanical progress concludes with extensive bibliographies of contributions, mainly from Iowa, on bacteriology, ecology, physiology, economic botany, seeds, morphology, mycology, paleobotany, and taxonomy.

Native dye plants and tan plants of Iowa, with notes on a few other species, HARRIETTE S. KELLOGG (*Proc. Iowa Acad. Sci.*, 19 (1912), pp. 113-128).—Lists of plants useful in making different dyes are given, along with a bibliography of the more easily accessible titles on the subject, including some of the older works.

Botanical features of the Algerian Sahara, W. A. CANNON (*Carnegie Inst. Washington Pub.* 178, 1913, pp. VI+81, pls. 37).—A report is given of field work in southern Algeria in 1910 and 1911, the object of which was to examine the physiological conditions prevalent in that region and to make some detailed studies of the root habits of the most striking species of the native flora.

Comparing the most striking characteristics of the vegetation of Algerian Sahara with that of the Tucson, Ariz., region where the Desert Laboratory is situated, the author considers the first as strictly desert, while Arizona is semidesert. The topography and vegetation of the 2 regions are said to have little that is similar and much that is different. In Arizona, where soil conditions are favorable for plants and the water supply not too meager, a perennial flora of some sort is supported, in marked contrast with the flora of the northern Sahara.

In conclusion the author states that plants with a water-balance are wanting in southern Algeria, while they constitute one of the striking features of the flora of the southwestern United States.

The coefficient of humidity: A new method of expressing the soil moisture, W. B. CRUMP (*New Phytol.* 12 (1913), No. 4-5, pp. 126-147, fig. 1).—The author proposes that in investigations of soil moisture in relation to plant association

a new coefficient of humidity be employed in which the water content is taken as a function of the humus content, i. e., the ratio $\frac{\text{water content}}{\text{humus content}}$ is used as an index of the relative soil humidity. The water content is determined by allowing samples of the topsoil and subsoil to dry out at about 15° C. until the weight is constant, the loss in weight being the required water content. After subjecting the samples to a red heat the resulting further loss in weight is recorded as humus content. These values are expressed in terms of 100 parts of air-dried soil. The coefficient was submitted to a wide range of tests under variable conditions, including different kinds of soils and plants, seasonal variations, and variations in the water content. In most cases results nearly identical for both topsoil and subsoil were obtained which seemed to conform on the whole to the conditions under which they were obtained.

It is concluded, however, that if the coefficient of soil humidity is to be of service in ecology it will only be by a study of definite habitats. The mean value of the coefficient of soil humidity is the most important constant to be ascertained for every association. This will first make necessary a determination of the supermaximum, maximum, minimum, and subminimum values of the coefficient for each such association, the subminimum representing the unavailable water.

Osmotic pressure and related forces as environmental factors, B. E. LIVINGSTON (*Plant World*, 16 (1913), No. 6, pp. 165-176).—Summarizing this contribution the author states that "the environmental force opposed to water intake may be manifest in any one of 4 forms, all of which are effective in the same way . . . osmotic pressure, the force of imbibition or capillarity, the force of crystallization of water, and the force of evaporation . . . The relative rates of inward and outward movement of water which determine the water content of cells, tissues, and organisms are directly determined by the magnitude of these forces on the one hand and of internal osmotic pressure or protoplasmic imbibition on the other."

Some quantitative researches on the permeability of plant cells, W. J. V. OSTERHOUT (*Plant World*, 16 (1913), No. 5, pp. 129-144).—As the result of experiments briefly discussed, the following claims are made:

The experiments indicate the untenability of the view that the outer layer of the cell protoplasm is composed of lipid substances, since such a view requires that only salts soluble in lipid should be able to penetrate. It is considered as proved that the antagonistic action of one salt on another is due to the fact that one salt hinders the other from entering the cell. The usual methods of determining the osmotic pressure of cells by means of salts are deemed faulty, true and false plasmolysis being often so confused as to lead to serious errors. It is thought possible by means of electrolytes to cause rapid and very considerable changes (either increase or decrease) in permeability, these changes being within wide limits completely reversible and entirely devoid of injurious effects. The plasma membrane, it is stated, is readily altered by a variety of substances in a way which indicates that it is protein rather than lipid. The permeability of the plasma membrane is apparently variable and depends on the nature of the substance with which the membrane is in contact, consequently the internal membranes of the cell (of the nuclei, vacuoles, plastids, etc.) may have a permeability different from that of the outermost plasma membrane. The electrical method employed is considered to be well adapted to studying the progressive effects of toxic substances on a plant in its natural environment. The permeability of a tissue is regarded as a delicate and accurate index of its vitality, affording a means of selecting sound tissue for experimentation.

The organization of the cell with respect to permeability, W. J. V. OSTERHOUT (*Science, n. ser.*, 38 (1913), No. 977, pp. 408, 409).—The author calls attention to the fact that in studies on permeability more than one surface must be considered. As an illustration of this, attention is called to a marine alga in which the protoplasm surrounds a large cell vacuole. Experiments with this showed that the outer surface of the protoplasm and the inner surface did not act alike with respect to their permeability.

A discussion of his experiments follows, and it is thought that the conception of differential permeability may perhaps be extended to surfaces other than those described. Since protoplasm is composed of a variety of structures and as each of these has a surface, it is quite possible that many kinds of semipermeable membranes may exist within a cell.

An investigation into the structure and functions of the skin of the potato tuber, F. STOWARD (*Jour. Nat. Hist. and Sci. Soc. West. Aust.*, 4 (1912), pp. 57-79, pls. 4).—The author gives an account of studies on the morphology and histology of the potato tuber, particularly with reference to the impermeability of the skin of the tuber to salts and acids, the absorption of water by tubers, and the effect of soaking tubers in brine and other salt solutions, acids, etc.

It was found that the skin of the cultivated tuber is protective against excessive loss of moisture and stored nutrient substances. The skin of the undamaged tuber is under ordinary circumstances impermeable to salts and acids in solution. This impermeability, however, is not possessed by blight-infected tubers. The skin of the tuber is held to be of considerable importance as a barrier against fungus and bacterial invasion.

Contributions to the study of nitrogen nutrition in plants, I. POUGET and D. CHOUGHAK (*Ann. Sci. Agron.*, 4. ser., 2 (1913), I, No. 4, pp. 281-302, figs. 5).—Continuing former studies (E. S. R., 27, p. 826), the authors state as the result of experiments in the nitrogen nutrition of millet that organic nitrogen was directly absorbed. Nitric nitrogen was the most available form of nitrogen and was absorbed almost or quite as rapidly as it is formed (differing herein from ammonia, which may be found in soils with or without plants). In the beginning of an experiment the influence of the nitrogen content of the soil water was evident, but the increasing requirements of the plant in spring tend finally to outrun the supply of available nitrogen, and the roots then play a part in the solution of a new supply of nitrogen.

Arsenic and manganese in leaves at different ages, F. JADIN and A. ASTRUC (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 26, pp. 2023, 2024).—Referring to articles previously published (E. S. R., 27, p. 830; 28, p. 526; 29, p. 28), the authors give the tabular results of analyses made at different stages of growth on leaves of several plants. These are claimed to show that the relative content of manganese or arsenic is greater in the older leaves, especially when the fresh weight is taken, being often reversed if the ash weight is considered.

Replacement of zinc by copper in the culture of *Aspergillus niger*, C. LEPIERRE (*Bul. Soc. Chim. France*, 4. ser., 13 (1913), No. 13, pp. 681-684).—The author reports that in addition to cadmium, glucinum and uranium, previously studied (E. S. R., 29, pp. 28, 422), later researches show that copper also is able to replace zinc in Raulin's nutritive solution in cultures of *A. niger*, giving a growth more rapid than in case of zinc or any of the others except uranium.

The action of sulphuric acid on seeds, C. BIANCHI (*Staz. Sper. Agr. Ital.*, 45 (1912), No. 9, pp. 681-715).—As the result of studies on 30 species comprised in 16 genera and 7 families, the author concludes that treatment with concentrated sulphuric acid shortens the period of germination in case of seeds of the species studied, all of which are impermeable to water. The accelerating

action of this acid under these conditions is said to be in relation to the presence of the malpighian layer.

The germination of barley, V. BIRCKNER (*Biol. Centbl.*, 33 (1913), No. 4, pp. 181-189).—The author finds that the presence of the scutellum in barley seeds does not favor, but hinders considerably, the conversion of starch products in sprouting seeds; that decrease of atmospheric pressure at the inception of softening of the seed is disadvantageous to germination; and that the employment of silver nitrate to disinfect the seeds was distinctly hurtful thereto, germinability being reduced to 80 per cent by employment of a 1.7 per cent solution for $\frac{1}{2}$ hour, of 0.34 per cent for 2 hours, or of 0.17 per cent for 4 hours.

Morphological modifications and floral anomalies due to the suppression of the endosperm in certain plants, J. A. URBAIN (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 10, pp. 450-452).—In a preceding note (*E. S. R.*, 29, p. 421) the author showed that the endosperm of certain seeds was not essential to the development of the embryo. He has carried out further experiments and reports at length upon those with castor bean, poppy, and *Nigella*.

In these the removal of the endosperm was found to induce dwarfing, bring about morphological modifications in the leaves, and cause precocious flowering, followed by a second normal flowering. Often the absence of the endosperm results in sex anomalies in dioecious plants, particularly during the first period of flowering.

Other experiments, with oats, maize, fennel, etc., gave results analogous to those of Tournois (*E. S. R.*, 26, p. 432), in which a reversal of the sex characters of the flowers of Japanese hops and hemp was obtained.

Floral anomalies in maize, appearing spontaneously in 1912, BERTHAULT (*Bul. Soc. Nat. Agr. France*, 73 (1913), No. 4, pp. 292-295, pls. 3).—This is a discussion of certain sexual anomalies of maize which are stated to have been so very common in Landes, France, as to reduce materially the crop returns for the year. These are considered to exhibit physiological disturbances due to excessive humidity combined with an abundance of nitrogenous material available in the soil.

Induced semiparasitism in cress, M. MOLLIARD (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 22, pp. 1694-1696).—The author reports having induced the semiparasitic growth of cress on beans by placing the germinated seed in wounds in the hypocotyl of beans, the cotyledons of which had been well developed. The cress plants were grown in this way for 40 days, and expanded their leaves and developed, indicating that it was possible by this means for the cress to obtain its necessary nourishment through the intervention of another plant.

A physiological study of the legume bacteria, E. B. FRED (*Virginia Sta. Rpts.* 1911-12, pp. 145-173, fig. 1).—A study has been made of *Bacillus radicola* to determine whether it fixes atmospheric nitrogen when grown apart from the host plant. Pure cultures of the organism were grown in a number of different media to determine if possible the relation between the amount of carbohydrates consumed and nitrogen fixed, to measure the formation of gum and its relation to nitrogen fixation, to note the effect of aeration, reaction of culture medium, temperature, and age of culture on the gain in atmospheric nitrogen, etc.

The legume bacteria were found to show a marked growth when cultivated on synthetic liquid or agar media, and possessed the power of fixing small amounts of atmospheric nitrogen when grown in a proper medium. The presence of a trace of nitrogen seemed to aid in the gain, while large amounts of nitrogen retarded the process. Maltose, saccharose, and mannite were found to be good sources of carbohydrates, the first perhaps being the most suitable.

When considered per unit of carbohydrate consumed, the legume bacteria fixed as much or more nitrogen than *Azotobacter*. The gum produced by the legume bacteria was found to contain little, if any, nitrogen. On culture solutions rich in nitrogen the amount fixed was found to come from the medium and not from the air. In a synthetic medium containing sugars the legume bacteria were found to form small amounts of acid. Oxidizing enzymes are present in the gum of legume bacteria. It was found that bacteroid forms may be produced by adding small amounts of caffeine or coumarin to the culture medium.

A bibliography of the subject is appended.

A cultural and morphological study of some *Azotobacter*, D. H. JONES (*Abs. in Science, n. ser.*, 38 (1913), No. 977, pp. 413, 414).—A brief account is given of studies of 16 colonies of *Azotobacter* isolated from garden soil at the Ontario Agricultural College. This study has been carried over a period of 2 years and comprises 4 distinct varieties or species, 2 of which resemble *A. chroococcum*; the other 2, *A. agilis*.

The morphological characteristics of the different forms are described.

The use of stains in the study of bacteria, E. B. FRED (*Virginia Sta. Rpts. 1911-12, pp. 202-205*).—A suggestion is given relating to the use of stains in the study of bacteria, two groups of materials being recognized, one of which contains stains that are reduced to a colorless compound, while in the other group the reducing power of the fungi is measured by the color formation.

Bibliography of smoke and smoke prevention: Effect on vegetation, E. H. McCLELLAND (*Mellon Inst. Indus. Research, Smoke Invest. Bul. 2, 1913, pp. 58-71*).—A bibliography of about 130 titles of publications relating to the effect of smoke on plant life is given.

FIELD CROPS.

[Field crops at the Fergus County substation], J. M. STEPHENS (*Montana Sta. Bul. 93, pp. 26-32*).—In variety tests with potatoes, out of 45 selections the highest average yields for 3 years, 1910-1912, were 147 bu. per acre by Green Mountain and 144.5 bu. by Pink Eye. In variety tests with winter wheat, out of 13 selections Kharkov gave the largest average yield of 40.72 bu. per acre, followed by Turkey with 36.34 bu. The White Smyrna variety of barley gave an average of 32.19 bu. per acre and Minnesota No. 105, 31.94 bu. as the best 2 out of 13 selections. Of spring wheats Fife produced an average of 27.17 bu. per acre and Galgalos 24.34 bu. as the best 2 out of 21 selections. Of 19 selections of flax tested in 1911, Selected North Dakota No. 1214 produced 3,300 lbs. straw and 18.2 bu. grain per acre, and Selected Russian 3,200 lbs. straw and 17.1 bu. grain.

The results of tillage method tests during 1909-1911 showed fall plowing 7 in., double disking, and harrowing to give the best yield of winter wheat, 35.9 bu. per acre, of the several methods tried. With spring wheat subsoiling, double disking, and harrowing gave the best results, viz, 24.5 bu. per acre, although this yield was closely followed (23.6 bu.) when the ground was spring plowed 7 in., double disked, and harrowed. Oats yielded best on ground spring plowed 3 in. and harrowed, 50.5 bu. per acre, followed closely by 49.6 bu., when listed and harrowed. Spring barley yielded 31.9 bu. on ground subsoil, double disked, and harrowed, and produced 30.2 bu. by listing and harrowing, which were considerably in advance of other methods. With corn there was very little difference in yields from land spring plowed 3 in. or 7 in., or subsoiled or listed, the yield being about 3½ tons per acre. Flax yielded 12.2 bu. on land spring plowed 3 in. and harrowed, and 11.8 bu. when the land was subsoiled, double disked, and harrowed. The introduction of fallow resulted in lowering the 3-year average with each kind of crops grown.

A list is given of 70 selections of alfalfa derived from 21 sources covering 17 countries, as well as hay yields of alfalfa, brome grass, orchard grass, oat grass, and timothy.

Forage crops, E. G. RITZMAN (*Porto Rico Sta. Rpt. 1912, pp. 43, 44*).—This paper reports results of trials of various introduced varieties of corn, sorghum, grasses, and legumes for forage purposes.

An African variety of sorghum (B. P. I. 25341), maturing in 100 days and yielding forage at the rate of 30 tons per acre, was the most promising, while Early Orange sorghum yielded second highest, viz, 11 tons per acre. Rape promised to be a successful forage crop for sheep, goats, and pigs. Both *Paspalum dilatatum* and Rhodes grass have been successful on low lands. Brown teff (*Eragrostis abyssinica*) and molasses grass (*Melinis minutiflora*) were successful, especially the latter. Pearl millet produced over 14 tons per acre, while hairy vetch was a failure. Alfalfa on limed land (1,500 lbs. lime per acre) yielded at the rate of 4 tons per acre at 3 months from seeding, and with additional lime (1,200 lbs. per acre) yielded 6 tons at the second cutting 3 months later. Crimson clover proved to be a failure. Stizolobium bean produced an immense crop of fodder. Cowpeas and sword beans were successful, but soy beans were a failure.

Experiments with legumes and grasses, H. DAMMANN (*Rev. Inst. Agron. Montevideo, 1910, No. 7, pp. 201-212*).—The following legumes and grasses, *Medicago sativa*, *Trifolium pratense*, *T. repens*, *T. hybridum*, *Lolium italicum*, *L. perenne*, *Avena elatior*, *Phleum pratense*, *Dactylis glomerata*, *Festuca pratensis*, *Poa pratensis*, and *Agrostis vulgaris* were grown. Alfalfa yielded 4,501 kg. of hay and *Trifolium hybridum* 3,047 kg. per hectare as the highest of the legumes during the first year; *Dactylis glomerata* 6,988 kg., *Avena elatior* 6,994 kg., and *Agrostis vulgaris* 5,069 kg. hay per hectare during the first year as heaviest among the grasses. Mixtures of these legumes and grasses are also discussed.

Irrigation experiments at Koppenhof, E. KRÜGER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 5 (1913), No. 3, pp. 186-196, pl. 1, figs. 6*).—These experiments were carried out with winter rye, lupines, and hay.

In the rye experiment the fertilizers applied per hectare consisted of 60 kg. potash in kainit, 30 kg. phosphoric acid in Thomas slag, 20 kg. nitrogen in ammonium sulphate as a fall application, and 15 kg. nitrogen in nitrate of soda in the spring. Seeding was at the rate of 140 kg. per hectare. A profitable yield of rye was produced with the fertilizer alone, but a larger yield followed the fertilizer without irrigation but harrowed twice. With irrigation without fertilizer the yield was increased considerably over the check plot, likewise with light irrigation plus fertilizer, but not to the extent as with harrowing and fertilizers. Heavy irrigation and fertilizer were followed by the largest yield of any treatment, 1,890 kg. grain per hectare in comparison with 780 kg. on the check plot.

In the lupine experiment the fertilizer per hectare consisted of 80 kg. potash in kainit and 30 kg. phosphoric acid in Thomas slag. The seeding was at the rate of 240 kg. per hectare. With fertilizer alone the yield was practically doubled, while with the additional use of small quantities of water it was raised to 1,240 kg. and with heavy irrigation to 1,410 kg. per hectare.

In the hay experiment the fertilizer applied per hectare consisted of 180 kg. potash in 40 per cent potash salt, 60 kg. phosphoric acid in Thomas slag, 20 kg. nitrogen in ammonium sulphate in April, and 30 kg. nitrogen in nitrate of soda in May and July. Cuttings were made June 27 and September 26. With the light irrigation the yield of hay increased from 2,830 to 4,520 kg. per hec-

ture, while the heavy application of water gave only a slight difference in total yield.

Cultivation and irrigation experiments, E. KRÜGER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg*, 5 (1913), No. 3, pp. 226-235, fig. 1).—In reporting 3 years' work with oats, rye, and barley, it is pointed out that the Zehetmar and Dembschinski methods of cultivation apparently gave increased yields over the ordinary methods, and this was especially true of the former. Better results are reported with 90 kg. of seed per hectare than with 60 or 120, while a drill distance of 30 cm. did not give so good results as 20 cm. With oats and barley an application of 30 mm. of water was followed by an increase in the yields in all methods of cultivation. Tabulated data are given.

Experiments on the utilization of light calcareous soils for intensive cultivations, E. JOUZIER (*Ann. École Nat. Agr. Rennes*, 5 (1911), pp. 65-96, figs. 5).—An application of 100 kg. nitrate of soda per hectare apparently increased the grain yield in 1911 495 kg.; 200 kg. nitrate of soda in 3 applications increased it 1,338 kg.; and 200 kg. in 1 application increased it 1,543 kg. over the check plats. Applications of 200 kg. nitrate of soda per hectare to beets, mallow cabbage, ruta-bagas, and white mustard also seemed to greatly increase the yields.

Field experiments, 1911 (*Godichnyi Ochet Ploti. Selsk. Khoz. Opytn. Stantsii*, 17 (1911), pp. 253-258).—In crop rotations including legumes the yield of rye was higher by an average of 365 kg. and wheat by 339.3 kg. per hectare than in rotations omitting legumes. An application of 35,000 kg. barnyard manure resulted in an increase in yield of wheat of 493.2 kg., and of rye of 1,269 kg. per hectare over no fertilizers. Sugar beets following the grain crop that had had the barnyard manure showed an apparent increase of 5,602.5 kg., and potatoes of 5,310 kg. per hectare. An application of 26.7 kg. per hectare of phosphoric acid in the form of superphosphate apparently increased the yield of wheat by 752.4 kg., and in the form of Thomas slag by 303.3 kg. per hectare. Rye was higher by 1,062 kg. per hectare with the superphosphate application.

Top-dressing pastures, R. S. GIBB (*Trans. Highland and Agr. Soc. Scot.*, 5, ser., 24 (1912), pp. 292-297).—This paper reports trials with basic slag, kainit, ground lime, and finely ground Algerian phosphate to determine why slag as a phosphatic manure should have been so variable in its effect as previously noted.

It is concluded that in all probability there were not many worn-out pastures which did not benefit by the application of phosphatic manures: Algerian phosphate, if finely ground, was not much inferior to slag if applied in the same quantity. Potash in any form should be first carefully experimented with on small areas. Ground lime at a ton per acre was of slight benefit as a surface dressing.

Experiments in fertilizing natural prairie consisting of red and white sands at Bretagne, L. FOURTON and H. COMPAIN (*Ann. École Nat. Agr. Rennes*, 5 (1911), pp. 137-140).—This paper gives tabulated data and discusses the results of applications of potassium sulphate, slag, superphosphate, barnyard manure, nitrate of soda, potassium carbonate, slaked lime, and unbleached wood ashes to meadows.

The check plats gave an average of about 5,000 kg. of hay per acre, and this yield was increased or decreased according to the kind of fertilizer used. In general the slag and the superphosphate induced the growth of the best varieties of herbage but did not result in high yields, while the potash and nitrogen fertilizers showed increased yields of hay, but this was of poor quality owing to the greater proportion of inferior grasses and weeds. This was especially noticeable with alfalfa plats.

The size of the seed planted and the fertility of the plant produced, J. A. HARRIS (*Amer. Breeders Mag.*, 3 (1912), No. 4, pp. 293-295, fig. 1).—This paper

discusses the increased yields following an increased weight of seeds in planting beans, and suggests to the breeder the importance of so planning his work as to take the purely physiological factors more fully into account than is generally done.

Crimson clover: Growing the crop, J. M. WESTGATE (*U. S. Dept. Agr., Farmers' Bul. 550*, pp. 15, figs. 5).—This publication gives the history and present distribution of crimson clover. Among the requirements for obtaining and maintaining a stand are mentioned lime and humus in the soil, and inoculation. Methods of seeding in intertilled crops, after early maturing crops, with late summer-seeded annual crops, with other legumes and grain, and alone, are described, as well as the treatment of crimson clover stands after seeding.

Corn culture and improvement, C. K. McCLELLAND (*Hawaii Sta. Press Bul. 42*, pp. 36, figs. 7).—This article summarizes available data as to corn production and utilization, with a view to inducing greater interest in corn growing in Hawaii.

Mosaic coherence of characters in seeds of maize, G. N. COLLINS (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 132*, pp. 19–21).—Results are described of observed mosaic coherence of color and endosperm character (waxy or horny) that was obtained in hybrids between Chinese maize and the common American maize. "In the first example the Chinese parent having the waxy endosperm had a colored aleurone and in the mosaic seed the waxy portion is overlaid by a colored aleurone. In the second example, the waxy parent was white and in the mosaic seed from this cross the waxy portion of the seed is white. In both seeds the form of the colored spot is irregular and the line separating the 2 kinds of endosperm follows the irregular margin of the spot with great precision."

Maize from the Sudan (*Bul. Imp. Inst. [So. Kensington], 10 (1912), No. 3*, pp. 389–393).—This paper reports an examination of maize which was grown in the Sudan. The medium length of the ears was $8\frac{3}{8}$ in., the circumference $6\frac{1}{2}$ in., and the weight 308.8 gm. The number of rows ranged from 12 to 20. In the heaviest ear the kernels formed 83.8 per cent and in the smallest ear 57.8 per cent of the total weight per cob. A table of analyses shows the composition of Sudan, South African, North American, and River Plate maize.

Ten years of corn breeding, E. D. FUNK (*Amer. Breeders Mag.*, 3 (1912), No. 4, pp. 295–302, figs. 4).—This paper discusses the results obtained by the ear-to-row method of corn improvement and points to the performance record as showing the superiority of the yield-per-acre unit over the score card as a method of selection. Some of the highest yielding strains of corn have been anything but ideal ears from the standpoint of the score card. It is also noted that a series of experiments showed that in 6 years out of 7 the smooth type of corn made higher yields than the rough.

Annual report of the Nebraska Corn Improvers' Association (*Ann. Rpt. Nebr. Corn Improvers' Assoc.*, 3 (1912), pp. 115, figs. 8).—This report gives the proceedings of the January, 1912, meeting at Lincoln, Nebr., including reports on the high-yield ear contest, 5-acre contest, and acre contest, and the following addresses: Keeping Farm Accounts, by C. W. Pugsley (pp. 10–15); The 160-acre Farm as a Business, by H. Gramlich (pp. 16–20); The Present Status of Corn Breeding Investigations, by T. A. Kiesselbach (pp. 21–29); Corn Breeding on the Farm, by F. A. Swanson (pp. 29–33); Report of Silage Tests, by E. Hopt (pp. 33–38); County Demonstration Farms, by J. R. Van Boskirk (pp. 39–50); Preparing the Ground for Alfalfa, by C. Y. Thompson (pp. 54, 55); Seed Laws, by E. P. Brown (pp. 55–58); Handling the Alfalfa Hay Crop, by W. A. Stacy (pp. 59–61); Method of Breaking up Alfalfa—Best Crops to Follow, by O. Hull (pp. 61, 62); Effect of Alfalfa on Soil Fertility, by L. S. Herron (pp. 62–65);

The Effect of Alfalfa on Soil Moisture, by W. P. Snyder (pp. 65-71); Time and Manner of Seeding Red Clover, by W. W. Louergan (pp. 71, 72); Clover v. Alfalfa in the Rotation, by C. Coupland (pp. 73-75); Soil Tillage, by W. W. Burr (pp. 78-86); A Review of the Seed Corn Situation, by E. A. Burnett (pp. 86-89); Report of Committee on Tenant Farm Problems, by D. S. Dalby (pp. 90-94); Report of Committee on Farm Labor, by S. A. Kinney (pp. 94-97).

Cotton farming in the Southwest, O. F. Cook (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 132*, pp. 9-18).—The author believes that "a new cotton industry is coming into existence in the Southwestern States. The dry climate affords protection against the boll weevil and many other insect enemies and diseases that often reduce or destroy the cotton crop in the East. The absence of wet weather in the harvest season also allows the western cotton to be gathered and sent to market in better condition. . . .

"The presence of the temporary population, not adapted to agricultural work or definitely interested in agricultural problems, makes it more difficult to secure an effective community development of cotton culture or other specialized industries. Cotton of high quality must be grown if the crop is to be profitable, and this requires the presence of an intelligent, efficient agricultural population. Another obstacle to the progress of cotton culture in the Southwest lies in the fact that the present methods of living and work are not well adapted to the climate. . . . The health and efficiency of the farming population are . . . likely to depend to a considerable extent upon the introduction and use of new plants able to grow through the summer in spite of the extreme conditions that are fatal to most of the food plants, fruits, and ornamentals raised in other parts of the country."

The improvement of cotton in India (*Bul. Imp. Inst. [So. Kensington], 10 (1912), No. 3*, pp. 351-372).—This paper gives descriptions of samples of seed cotton grown in Madras, Central Provinces, United Provinces, Burma, Eastern Bengal, and Assam. In Burma, it is noted, the yields of seed cotton ranged from 150 to 750 lbs. per acre and the percentage of lint from 27 to 30.

Cropping to flax on new lands of semiarid land areas, H. L. BOLLEY and W. L. WILSON (*North Dakota Sta. Bul. 103*, pp. 29-57, figs. 27; *Montana Sta. Circ. 22*, pp. 35-65, figs. 27).—This discussion is issued jointly and simultaneously by these stations. It describes methods and gives directions for putting in, harvesting, and caring for the flax crop on new lands, under the following captions: Diseases, grading the seed, disinfecting the seed, preparing the seed bed, types of tools, depths of plowing, how to determine whether to seed immediately following the plowing in the spring or to summer work the land for the crop the following year, time of seeding, rate of seeding, calibrating the drill, planking, crop rotation, summer cultivation, volunteer flax, flax after corn, and irrigation. Emphasis is placed on the importance of completely turning the sod, packing immediately behind the plow, and preparing a fine level seed bed to conserve the soil moisture, and on carefully selecting, grading, and treating seed, and conducting crop rotation.

Flax breeding experiments in 1909-1911, L. ALTHAUSEN (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 13 (1912), No. 2, pp. 184-191).—The author gives the results of an examination of plants produced from a mixture of seeds, from which it is concluded that there were 2 distinct varieties. This conclusion was based upon the measurements of the height of the plant and the length of stem, which characters reproduced themselves in the succeeding generation. The stems of the long-stemmed varieties ranged from 43.6 to 49.7 cm. (from 17 to 19 in.), while the short stems averaged 33.1 cm. The total height of the long-stemmed varieties ranged from 84.5 to 89.6, while the short stems averaged 70.4 cm.

Comparisons of yield between hybrids and selections in oats, H. H. LOVE (*Amer. Breeders Mag.*, 3 (1912), No. 4, pp. 289-292).—This paper gives data on yields which show that in a 3-year average 10 selected varieties of oats did not produce as well as their hybrids, the yields being 53.1 and 54 bu. per acre, respectively. In a 2-year average the yields were 58.1 and 59 bu., respectively. In the best yields of the hybrids a single variety figured largely, thus indicating the possible advantage of some one variety in making crosses for given localities.

"These results show the possibilities of improving the oat crop by the selection of good plants from a variety or by the combination through hybridization of the desirable qualities of different varieties."

Report on the experimental potato fields, 1911-12, G. SEYMOUR (*Jour. Dept. Agr. Victoria*, 11 (1913), No. 3, pp. 166-174, figs. 2).—In variety tests and manurial experiments during the season 1911-12, the use of 265 lbs. of Thomas phosphate was followed by an average of 4 tons 8 cwt. 39 lbs. of potatoes per acre, whereas with 224 lbs. superphosphate the average was 4 tons 68 lbs. Descriptions are given of a few new seedling varieties.

The culture of rice in Madagascar, L. GALTIE (*Bul. Écon. Gouv. Gén. Madagascar*, 12 (1912), I, No. 1, pp. 13-29).—This paper gives a description of the cultivation of rice in Madagascar, including the classification, method of culture, preparation of the soil, seeding, work in the nurseries, harvesting, and returns per acre, together with discussions on threshing, decortication, and a description of the cultivation in marshes and on upland farms.

Sugar-beet culture in South Dakota, J. H. SHEPARD (*South Dakota Sta. Bul.* 142, pp. 163-184, figs. 4).—This bulletin gives a brief historical résumé of work carried on at intervals since 1888, some of which was in cooperation with this Department. Methods of cultivation are described whereby yields of beets have reached from 26,515 lbs. to 47,593 lbs. per acre, with a percentage of sugar ranging from 16.2 to 22. By severe seed selection from analyzed mother beets the percentage of sugar has been greatly increased, one individual reaching 25.4. Great improvement has also been made in the uniformity of percentages of different individual beets. The number of beets of a single mother beet falling below 15 per cent was at first from 50 to 100 per cent, while at the end of the second season only from 0.9 to 7 per cent fell below the standard, and in 4 years' time the standard was raised to 18 per cent of sugar. It is noted that the best product has been grown on upland rather than on low black, mucky bottom land.

See also a previous note (*E. S. R.*, 25, p. 738).

Storing and marketing sweet potatoes, H. C. THOMPSON (*U. S. Dept. Agr., Farmers' Bul.* 548, pp. 15, figs. 9).—This publication gives as important factors in keeping sweet potatoes, maturity, careful handling, thorough curing after being put in the house, and uniformity of temperature. Directions and a bill of material for the construction of a storage house to meet these requirements are given, as are also some good market varieties and directions for harvesting and marketing.

The Cornell experiments in breeding timothy, H. J. WEBBER (*Amer. Breeders Mag.*, 3 (1912), No. 2, pp. 85-99, figs. 5).—A discussion based largely upon data previously noted (*E. S. R.*, 27, p. 535).

Additional knowledge on the inheritance of the winter resistant character of winter wheat, H. NILSSON-EHLE (*Ztschr. Pflanzenzücht.*, 1 (1912), No. 1, pp. 3-12).—The discussion in this paper covers observations on the behavior of different varieties of wheat and their hybrids under various degrees of winter severity during periods between 1900 and 1912.

The results of crossing 2 medium hardy varieties produced lines that exceeded the parents in both directions in degree of winter resistant character—that is, some being unaffected by the winter weather and others being entirely killed under the same conditions. The author concludes that the winter resistant character is transmitted similarly to other characters, that crossing results in segregation of gradations of this character, whether the parents are of widely different or of medium winter resistant varieties, and that it seems to be the result of a variety of combinations of many Mendelian factors.

The spontaneous appearance of a wheat hybrid, B. KAJANUS (*Ztschr. Pflanzenzücht.*, 1 (1912), No. 1, pp. 13–24).—This paper discusses the study of wheat characters based upon the appearance in 1908 of a wheat plant of the awnless type in a plat of pedigreed *Triticum turgidum*, which is a heavily awned type. Seeds of this plant were planted in successive years, and the results of the segregation of some of the characters led the author to consider this an accidental cross from the pollen of *T. vulgaris* which was growing in the vicinity. The following deductions were made:

Cross-fertilization readily occurs with wheat. Hairy and smooth characters of the spikelet form a Mendelian character pair which, through the presence or absence of a hairy genetic factor, may be explained. Awned and awnless also form a Mendelian character pair that depends upon the presence or absence of a restraining genetic factor. The close glumed factor of *T. spelta*, which, with the open glumed factor of *T. vulgaris* is dominant, becomes recessive when combined with *T. turgidum*, probably because that of the latter type is genetically different from the common wheats. The character pairs, heavy and smooth, awned and awnless, open and closed glumes, mendelize independently of each other. The square-headed type is recessive when combined with a loose-headed type. There is a nearly compact head type which remains recessive when combined with a loose head type, while a true compact head type is dominant with a loose head type. Two genetic factors seem to be present in the formation of pubescence of wheat.

The management and care of plant breeding plats, L. KIESSLING (*Ztschr. Pflanzenzücht.*, 1 (1912), No. 1, pp. 25–36).—This paper describes field methods employed by various plant breeders and discusses the laying out and maintenance of plats and paths; the relative advisability of strips between plats and solid planting; the comparison of field with plat culture; the question as to whether the plat should be in the midst of the general field or isolated; and methods of hand and team labor. It deals with cereals, legumes, and cultivated crops.

Plant breeding in Scandinavia, L. H. NEWMAN (*Ottawa, Canada, 1912, pp. 193, pl. 1, figs. 62*).—In describing the methods employed at the Svalof experiment station the author covers the work of the Swedish Seed Association, and gives the methods first employed in plant breeding at this station, the development of the pedigree system of selection of grains, the composition of a race of cereals and its variabilities, methods of applying practically the principles of cereal breeding, and a summary of the work done with different cereals, legumes, grasses, and potatoes.

The adulteration and misbranding of the seed of hairy vetch, W. A. TAYLOR (*U. S. Dept. Agr., Office Sec. Circ. 45, pp. 6*).—This circular gives the results in tabular form of tests of 207 samples of hairy vetch seed obtained in the open market in 1912 and found to be adulterated or misbranded, 17 containing no hairy vetch seed. These samples made up 53 per cent of the total number collected, as compared with 62 per cent in 1911 (*E. S. R.*, 27, p. 141).

The weed problem, L. H. PAMMEL (*Trans. Iowa Hort. Soc.*, 47 (1912), pp. 188-198).—The author discusses the recognition of weeds and their dissemination, and offers suggestions for controlling them.

HORTICULTURE.

Report of the horticulturist, C. F. KINMAN (*Porto Rico Sta. Rpt.* 1912, pp. 23-27, pl. 1).—This is the usual progress report on the station's work with fruits, vegetables, and miscellaneous plants (*E. S. R.*, 27, p. 841).

During the year an experiment was conducted to determine the practicability of packing for direct shipment the uncultivated oranges on the coffee plantations where they are grown instead of selling the ungraded fruit at small prices to shippers at seaports. The results indicate that this excellent uncultivated fruit can be cheaply harvested and marketed by the laborers on the plantations with but little loss of fruit by decay and that the profit will be much in excess of that received by following the old method. In a demonstration to show the results of skin injuries, 3 boxes of sound and 3 of skin-punctured fruits were packed and stored 11 days. When opened 3 per cent from the sound boxes had decayed as compared with 34 per cent of the punctured fruits.

The cooperative fertilizer experiments have been practically closed and the data are being arranged for publication. They show in general that the plats receiving a complete fertilizer yielded much better, in some cases 100 per cent more, than those receiving an incomplete fertilizer. All fertilized plats produced much more than the check plats. The plats receiving potash and nitrogen gave the lowest yield for any of the fertilizer plats. Only small differences have thus far been observed between the use of muriate and sulphate of potash.

Work with various types of citrus stocks has been continued and wide differences in thriftiness of seedling types have been noted. The test is on a slightly sloping site in a heavy clay which does not drain well. Hence the growth performance is generally unsatisfactory. Plantings of various types have been made in a more favorable soil for testing under orchard conditions. The citrus variety orchard (*E. S. R.*, 25, p. 740) has proved so unsatisfactory that it was removed during the year. Hart late oranges and Duncan and Marsh seedless grapefruit withstood the adverse conditions best.

The variety test of native and foreign mangoes was continued, 54 foreign types are now being cultivated at the station, the larger part of these being East Indian varieties. A number of these imported varieties fruited during the year, all of which possess the favored qualities of the eastern mango and are far superior to the native types. Several varieties promise to be of value for ornamental use where a tree of symmetrical head and heavy foliage is desired.

During the year a coconut fertilizer and general cultural experiment was started in a grove situated near the coast in cooperation with Guanica Centrale. Cultural, fertilizer, and variety tests with sweet potatoes, yautias, dasheens, and yams were continued. The influence of distance and size of tubers planted, which was tested with the yam variety Potato, has been very marked on the yield. Where hills were planted 2 by 2 ft. on level land, the calculated production per acre was over 13 tons of tubers, as compared with a little over half as much where planted 4 by 4 ft. In the ridge plantings the yams which were separated 20 in. gave 5.07 lbs. of tubers per hill, while when planted 10 in. apart the yield was 3.93 lbs. per hill. Where medium-sized tubers were planted the average yield per hill was 5 lbs., and where small tubers were planted, 4 lbs. per hill. This variety is considered promising since the yield is heavy and the starch content of the tubers 23½ per cent.

Twenty varieties of eucalypts have been planted on high sloping land to compare with the same varieties which have been growing on low land for a number of years. Thus far the kinds making the most vigorous growth on the high land are *Eucalyptus robusta*, *E. tereticornis*, *E. rostrata*, and *E. paniculata*. On the lower poorly drained soil *E. robusta*, *E. piperita*, and *E. tereticornis* are the only promising ones, though many trees of other varieties are living and making some growth. Many of the seedlings planted during the year were affected with crown gall, but thus far no apparent damage has resulted, the most thrifty trees often having the largest galls.

In a previous report relative to the degenerating influence of Porto Rican conditions on imported vegetable varieties, it was concluded that okra and beans had degenerated both in vigor of the plants and productiveness (E. S. R., 27, p. 842). It has been found, however, in the case of the Early Valentine bean that since the second generation there has been a gain in productiveness during successive generations until the eighth generation has exceeded the yield from the first generation. Duplicate plantings from the original seed, from the second, and from the eighth generations were made in Porto Rico and in Minnesota during the summer and the harvest results ranked the same with different generations. With White Velvet okra on the other hand the second generation has in different plantings resulted in the most vigorous plants and heaviest yield, whereas the successive generations gradually deteriorated. With other crops under observation, the results are not pronounced.

In a test with subirrigation *v.* surface irrigation a number of varieties of tomatoes, peppers, beans, onions, and eggplant were grown, each of which produced better and were much less expensive to cultivate in the subirrigated area. In addition to their value for irrigation the underground tubes gave beneficial drainage results during the wet season.

Horticultural investigations at the Woburn Experimental Fruit Farm (*Nature* [London], 91 (1913), No. 2287, pp. 675-678, figs. 3).—This comprises a report of a lecture delivered by S. U. Pickering in which the author gives a general account of the horticultural work at the Woburn farm.

Vegetable culture in north Louisiana, E. J. WATSON (*Louisiana Stas. Bul.* 141, pp. 28).—This bulletin contains directions for the culture of the staple vegetables in north Louisiana, both during the fall and winter season and during the spring and summer season. The subject matter is based on long experience with vegetables at the Calhoun substation.

Inheritance in cabbage hybrids, H. L. PRICE (*Virginia Sta. Rpts.* 1911-12, pp. 240-257, figs. 12).—The author here combines his previous observations on first generation hybrids (E. S. R., 28, p. 639) with additional observations on the second and in some cases the third generation hybrids. Numerous crosses were made and in most cases reciprocal hybrids were under observation. The following set of differentiating attributes were involved: Blistered and smooth leaf, head and headless cabbage, cabbage and cauliflower type of head, cauliflower and headless cabbage, terminal and axillary bud (head) growth, and kohlrabi and head cabbage.

In all of these crosses the resultant hybrid considered as a whole presented the appearance of a blend, but when the above differentiating characters alone were considered one character usually dominated the other, although the dominance could not be called absolute or complete in all cases. No segregation of these characters took place in the second generations.

The blistered or crinkled foliage of the Savoy cabbage remained dominant over smooth foliage even in some third generation hybrids. Head cabbage was dominant over collards or headless cabbage, although there was a tendency to less solid heads in the hybrid forms. The cabbage head likewise dominated

the cauliflower head, although the shape of the head was changed and its solidity greatly decreased in the hybrid forms. Direct and reciprocal crosses of cauliflower with collards showed that the premature and abortive blooming characteristic of cauliflower is not a dominant character, the headless type dominating in both F_1 and F_2 generations. Plants from the cauliflower seed plant seemed to be distinctly more hardy to cold than the reciprocal lot but no other difference could be detected. Crosses made between kohl-rabi and other types of cabbage retained the kohl-rabi type in the offspring, although the development of the fleshy part of the stem was variable. In the crosses between Brussels sprouts and various types of cabbage representing terminal and axillary bud (head) growth, the result appears to be a mosaic. This is presumed to be due to the fact that there is no actual pairing between terminal and axillary heads or buds but that each is dominant to its absence.

As a result of these investigations the author concludes that "the inheritance in the first generation is preponderant if not completely dominant. The lack of segregation in the F_2 hybrids indicates that the inheritance for these characters in cabbage is not Mendelian but permanently preponderant or exclusive. The mode of inheritance here should have an important bearing on breeding practice. Permanent hybrids need only be improved and perfected through pedigree selection in order to establish new and valuable varieties."

Cabbage and cauliflower in Montana, L. G. SCHERMERHORN (*Montana Sta. Circ.* 25, pp. 135-147, figs. 6).—A practical treatise on the culture of cabbage and cauliflower, including also information relative to methods of storing.

Celery culture in Montana, O. B. WHIPPLE (*Montana Sta. Circ.* 26, pp. 149-156).—This circular contains popular instructions for growing, harvesting, marketing, and storing celery.

The cultivation of American ginseng, W. VAN FLEET (*U. S. Dept. Agr., Farmers' Bul.* 551, pp. 14, figs. 3).—A practical treatise on ginseng culture in which are discussed the botany of the ginseng plant; method of starting the plantation; the culture of ginseng, including planting the beds, mulching, ventilation, and protection; ginseng varieties; diseases of ginseng; forest plantings; and digging the root.

Relative to the future of ginseng culture, the author concludes in part as follows: "Under the present conditions of production ginseng offers attractive possibilities to patient cultivators who are in sympathy with the limitations of growth and the slow development of woodland plants in general and who are willing to make a material outlay with only scanty returns in view for several years to come, but it holds out little inducement for inexperienced growers looking for quick profits from a small investment."

[**Horticultural statistics**], G. ROBERTSON (*Rpt. Cal. Bd. Agr.*, 59 (1912), pp. 114-169).—This comprises a statistical account including historical notes relative to the orchard, small fruit, and nut industries of California, together with some comparative data for other important fruit growing sections.

Information for fruit growers with list of varieties for commercial and home planting, R. M. WINSLOW (*Brit. Columbia Dept. Agr. Bul.* 51, 1913, pp. 55, pl. 1).—This bulletin contains practical suggestions relative to the culture of orchard and small fruits, including lists of varieties adapted for various districts in British Columbia.

Fertilizer experiments with fruit trees, A. MAGNIEN (*Jour. Soc. Nat. Hort. France*, 4. ser., 14 (1913), July, pp. 422, 423).—Experiments conducted for 6 consecutive years with a large number of fruit trees lead the author to conclude that basic slag is especially suited as a supplementary manure for fruit trees

as it leads to the abundant production of fruit buds. The author's experiments are being continued.

Influence of fertilizers on the conservation of fruits, N. ESPAULLARD (*Jour. Soc. Nat. Hort. France*, 4. ser., 14 (1913), July, p. 421).—In confirmation of his previous results (*E. S. R.*, 27, p. 644) the author concludes that phosphatic and potassic fertilizers exert no deleterious influence on the conservation of pears.

The diseases of fruit trees, R. EWERT (*Die Krankheiten der Obstbäume. Berlin, 1913, pp. 118, figs. 51*).—A practical treatise on the important diseases and insect pests of orchard fruits, including directions for their control.

Spraying investigations for 1912, J. L. HEWITT (*Arkansas Sta. Bul. 114, pp. 505-545, figs. 3*).—This bulletin embodies the results of all the minor investigations concerned directly with spraying that have been carried on by the station during the past year.

In order to determine whether it is possible to combine spraying for San José scale with the first spraying for scab by using the strong scale mixture after the cluster buds are open and before the blossoms are open, trees of different varieties were sprayed with strong lime-sulphur mixture during the spring of 1912. The results of this test, together with observations of similar tests in private orchards, show that apples may be sprayed with the strong lime-sulphur mixture at 4½° B. at the time for the first scab spraying. It can not be stated positively, however, that the use of this mixture at this time will control the scale.

An observation was made of a supposed spray injury from the second spraying of apples, in which the leaves had a peculiar curled appearance, looking as if burned. The injury was found in both sprayed and unsprayed orchards and was apparently due to a fungus, although no spores were found by which it could be identified.

An investigation of injury to peach trees from commercial lime-sulphur spray in an orchard sprayed under the advice of the station showed that the injury was partly due to making the mixture too strong and partly to overdrenching the trees. A mixture at the strength of 1:75 caused some injury to the leaves, even when carefully applied. A mixture of 1:100 apparently caused no injury when the mixture was carefully applied but with overdrenching caused more or less injury. The author points out the distinguishing characteristics of injury to peach leaves caused by lime-sulphur, injury caused by arsenicals, and that caused by fungus attack. Recommendations are given for spraying peaches, including suggestions relative to choosing and using a spraying outfit.

Investigations were made of various commercial nozzles of the eddy chamber type with reference to distribution of spray mixture, effective force of the spray, effective amount of spray, total amount of spray, effects of changing the diameter and the depth of the eddy chamber, changing the size of the hole in the disk, and changing the thickness of the disk, and effect of size of hole in the basal plate. The results of the nozzle tests as tabulated show the diameter of the hole in the disk, the diameter and depth of the eddy chamber, and the total amount of liquid that they give at 150 lbs. pressure. The results as a whole indicate that the best nozzle for Arkansas conditions is one with an eddy chamber ¾ in. in diameter and ¼ in. deep, and a disk with a hole ⅝ in. in diameter.

Fumigation and spraying, H. GARMAN (*Kentucky Sta. Bul. 172, pp. 193-209, pls. 4, figs. 4*).—This bulletin contains instructions for the use of hydrocyanic acid gas, carbon bisulphid, carbon tetrachlorid, and tobacco extracts as fumigants in destroying insect pests on nursery stock, and in dwellings, mills,

seed houses, and hothouses. Directions are also given for the treatment of underground pests, together with general instructions for spraying apples, peaches, plums, shade trees, field crops, weeds, and ornamentals.

The requirements of the Kentucky nursery and orchard inspection law are also included.

The new Arkansas law with reference to the inspection of nurseries and the transportation of nursery stock (*Arkansas Sta. Circ.* 17, pp. 6).—The text is given of an act, approved April 2, 1913, to prevent the introduction and dissemination of insect pests and plant diseases on nursery stock in Arkansas.

Storage of apples in peat dust, E. NYSTRÖM (*Svenska Mosskulturför. Tidskr.*, 27 (1913), No. 4-5, pp. 375-380, pls. 3).—In experiments conducted with 3 varieties of apples it was found that the losses from evaporation and decay were greatly reduced when the apples were stored in peat dust. This material may advantageously be used for storage of apples on a small scale where no good fruit storage building is available. The peat must be rather dry and a cool, fairly insulated room used for storing the fruit.

Grape breeding, F. MUTH (*Ztschr. Pflanzenzücht.*, 1 (1913), No. 3, pp. 347-393, figs. 2).—This comprises a résumé of investigations dealing with the improvement of grapes, including references to cited literature.

Sugar and acid in oranges and grapefruit, S. E. COLLISON (*Florida Sta. Bul.* 115, pp. 3-23).—This comprises a study of the chemical changes which take place in the ripening of citrus fruits, the work being carried on by the station in cooperation with the Florida Citrus Exchange. Analyses of over 500 lots of oranges and grapefruit, extending from October 1, 1912, to May 2, 1913, are reported. The samples of fruit analyzed were obtained from over 20 different localities, and fruits grown on a great variety of soils and with various kinds of fertilizers are represented.

The data secured for oranges show in general that there is a gradual increase of total sugar and a gradual decrease of acidity toward maturity. Both sucrose and reducing sugars increase at about the same rate, but with the former averaging higher than the latter. Apparently all the acid of the fruit is formed early in the season, while sugar continues to be formed until maturity. The increase of sugar and decrease of acid is also apparent in grapefruit, but not nearly in so marked a degree as in the orange. After grapefruit reach maturity there is a noticeable increase in reducing sugar with a corresponding decrease in sucrose, pointing to a breaking down of sucrose into dextrose and fructose.

The demarcation between fruit classified as sour and that classified as sweet lies near the ratio of 1 of acid (anhydrous) to 7 of sugar in the grade here called tart. The demarcation between fruit classified as very sour and that classified as sour lies near the ratio of 1 of acid (anhydrous) to 4 of sugar. The 2 methods of sampling employed, 12 fruits from 1 tree and 1 fruit from each of 12 trees, showed no essential differences in the results.

Report of the assistant horticulturist, T. B. MCCLELLAND (*Porto Rico Sta. Rpt.* 1912, pp. 28-30, pls. 4).—A progress report on the station's work with coffee, vanilla, rubber, and cacao (*E. S. R.*, 27, p. 844).

In the fertilizer and cultural experiments with coffee the differences after 2 years' treatment appeared to be small in comparison to the differences caused by the position of the tree, that is, generally speaking, whether the tree is on the upper or lower part of a slope. On many slopes in the station's plantings the trees below are in fine condition and those above poor. Cultivation and the application of complete fertilizers have so far failed to overcome these unfavorable conditions. Among the plantings of foreign coffee (*Coffea arabica*)

the Padang is unusually fine, some of the trees being more than 11 ft. high at a little over 3 years from seed.

An experiment in felling the coffee shade on a part of the college farm to rid the coffee of the destructive ant (*Myrmelachista ambigua ramulorum*) has been highly successful. Tests of coffee seed were repeated during the year with the result, as of previous tests, that seed that had been severely dried showed a rapid loss of viability.

In the test of different varieties of vanilla *V. planifolia* appears promising since it held its pods during very dry weather. Of the plantings of 200 trees of *Castilla* sp. of rubber made in 1903 less than 100 have survived to date. The trees have grown best on lower land near water. It was found that the viability of *Castilla* seed could be prolonged considerably by keeping the seed between layers of fine soil and charcoal, mixed and slightly dampened. Even with this method, however, the germination percentage fell rapidly after 5 weeks.

The banana in Fiji, C. H. KNOWLES and F. P. JEPSON (*Dept. Agr. Fiji Bul.* 4, 1912, pp. 17, pls. 3).—A brief popular treatise on banana culture, including information relative to the treatment of insect and fungus pests, and regulations for shipping fruit.

Annonaceous possibilities for the plant breeder, P. J. WESTER (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 7, pp. 312-321, pls. 6).—The author calls attention to the possibilities of the genus *Annona* from the standpoint of tropical plant breeders, and described some 49 species which are believed to be worthy of introduction and cultivation for breeding work, for testing as stocks for the species already in cultivation, or for ornamental purposes.

The development of the red hybrid tea rose (*Gard. Chron.*, 3. ser., 54 (1913), Nos. 1386, pp. 41, 42; 1387, pp. 64, 65; 1389, pp. 99, 100).—This comprises a historical sketch of the development of modern red roses.

FORESTRY.

The relation of forests in the Atlantic plain to the humidity of the central States and prairie region, R. ZON (*Science*, n. ser., 38 (1913), No. 968, pp. 63-75, figs. 2).—The general conclusion reached in this paper is that forests in wide plains of continents, especially in the path of moist winds, "by increasing the evaporation from the land at the expense of surface run-off enrich with moisture the passing air currents, and in this way help to carry it in larger quantities into the interior of continents. The destruction of such forests, especially if it leaves the ground bare or partly covered with only weak vegetation which does not transpire large quantities of water, must inevitably affect the climate, not so much the climate of the region in which the destruction took place but the drier regions into which the prevailing air currents flow." The author, however, lays special emphasis upon the fact that "the effect of forests upon climate, if viewed as a local influence, must necessarily be insignificant. . . . Local observations, no matter how accurately and minutely carried out, can not lead us to the solution of the problem."

Pros and cons on the forest and flood question, T. P. ROBERTS (*Prof. Mem. Corps Engin. U. S. Army*, 5 (1913), No. 23, pp. 568-585, figs. 3).—The author presents considerable data to support his contention that forests have very little influence on the flood stage of streams.

Forest laws of Vermont and instructions to fire wardens and others regarding forest fires, A. F. HAWES (*[Vt.] Forest Serv. Pub.* 12, 1913, pp. 28, pls. 3).—Part 1 of this pamphlet contains the act creating the State Board of Agriculture and Forestry in 1908, together with all laws pertaining to forestry which

have been subsequently enacted. Part 2 contains information as to fire wardens and other officials, as well as to the public, relative to the prevention and control of forest fires.

Forestry in Trinidad, C. S. ROGERS (*West Indian Bul.*, 13 (1913), No. 3, pp. 270-278).—This comprises an account of forest conditions and forest management in Trinidad, together with descriptive notes on the principal trees in common use.

Present state of forestry in Portugal, J. F. BORGES (*Internat. Inst. Agr. [Rome]. Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 7, pp. 989-997).—A descriptive account discussing forest legislation, direct and indirect action of the State, action of the communes and of public institutions, private enterprise, causes of reforestation, forest wealth of the country, geographic distribution of the forest trees, methods of forestry, exotic plants, proposed work of reforestation, and importation and exportation of forest produce.

Report on forest administration in the Central Provinces and Berar for the year 1911-12, M. HILL, H. H. HAINES, and A. W. BLUNT (*Rpt. Forest Admin. Cent. Prov. [India], 1911-12*, pp. 2+14+64+CIH).—This is the customary report relative to the administration of state forests in the Northern, Southern, and Berar Circles of the Central Provinces, including a financial statement for the year 1911-12. All important data relative to alterations in forest areas, forest surveys, working plans, protection, and miscellaneous work, yields in major and minor forest products, revenues, and expenditures are appended in tabular form.

Progress report on forest administration in the Punjab for 1911-12, J. COPELAND (*Rpt. Forest Admin. Punjab, 1911-12*, pp. [8]+3+18+LVII, pls. 5).—Data similar to the above are given relative to the administration of the state forests in the Punjab for the year.

Forest distribution in the San Juan Islands, G. B. RICE (*Plant World*, 16 (1913), No. 6, pp. 177-182, figs. 4).—A preliminary study of forest distribution on the San Juan and other islands of the State of Washington, with special reference to the relation between soil formation and forest cover.

The indigenous trees of the Hawaiian Islands, J. F. ROCK (*Honolulu, 1913*, pp. [8]+518, figs. 215).—This work comprises both popular and technical descriptions of the trees peculiar to the Hawaiian soil. To the many native trees already known the author has added a large number of new species and varieties. The introductory chapter describes all of the floral regions and their plant associations found in this island group. Under each species a complete reference and synonymy is given as far as possible. In addition to the technical descriptions, native names are given under most of the trees as well as any legendary or other facts of sufficient interest, together with habitat, plant association, etc.

Important and noteworthy woody plants of German East Africa.—I, Introduced foreign species, W. HOLTZ (*Pflanzer*, 9 (1913), *Beiheft 1*, pp. 40, pls. 12).—This is the first of a series of contributions on the useful and decorative woody plants of German East Africa. Twelve species are described in the present paper with reference to their botany, origin, geographic distribution, uses, growth requirements, culture, diseases, and other enemies. A bibliography of cited literature is included.

Vitality and distribution of growth in defoliated larch trees, A. G. HARPER (*Rpt. Brit. Assoc. Adv. Sci., 1912*, pp. 684, 685).—Upon examining trees partially or completely defoliated in two or more successive seasons by the larvæ of the large larch sawfly (*Nematus erichsonii*) the author found a reduction in radial growth increment and a reduced percentage of autumn wood. These effects are greatest at the base of the trunk and steadily decrease toward the

top of the tree. Other points noted in the study were the pathological formation of zones of contiguous resin ducts, especially at the boundary between two annual rings, and a production of partial rings even over very small areas of the meristematic sheath when the cambium is failing in activity. The hardness of the timber seems to be independent of the percentage of autumn wood in the annual rings.

Some Douglas fir plantations.—I, Taymount plantation, Perthshire, F. SCOTT (*Jour. Bd. Agr. [London]*, 20 (1913), No. 5, pp. 402-416).—This plantation, which was established in 1860, is discussed with reference to its silvicultural conditions and history, and estimates are given of timber volume, including comparisons of volume measurements made in the past, quality of the timber, and value of the plantation in 1912.

Rubber experiments in Trinidad and Tobago, A. E. COLLENS (*West Indian Bul.*, 13 (1913), No. 3, pp. 219-235).—The work here summarized consists principally of data on experimental tapping tests of a number of Hevea and Castilla trees which have been introduced into Trinidad and Tobago from time to time.

Rubber experiments in British Guiana, J. B. HARRISON, F. A. STOCKDALE, and S. H. BAYLEY (*West Indian Bul.*, 13 (1913), No. 3, pp. 236-252, pls. 6).—This comprises a review of tests which have been made with various kinds of rubber-producing trees during the period 1908 to 1912. The subject matter is discussed under the general headings of experiment station trials, estate plantings, and miscellaneous investigations.

The rubber tree book, W. F. DE B. MACLAREN (*London [1913]*, pp. XVI+307, pls. 2, figs. 87).—This comprises a practical treatise on rubber culture, including detailed information relative to the care and management of a rubber plantation.

Report on the wood-using industries of Florida, H. MAXWELL (*Fla. Quart. Bul. Agr. Dept.*, 23 (1913), No. 3, pp. 7-85).—A report on the wood-using industries of Florida, based on an investigation conducted by the Forest Service of the U. S. Department of Agriculture in cooperation with the State. Data are given showing the consumption and cost of native woods and other woods, both by species and industries, together with brief descriptions of the various species used. A large number of unused woods of Florida are also described, and suggestions are given relative to the utilization of these woods. An abridgement of the several census reports relative to the lumber cut and wood-using industries of Florida is appended, together with a list showing the various articles manufactured from different species of wood and a directory of Florida wood-using manufacturers.

Cooperage, J. B. WAGNER (*Yonkers, N. Y., 1910*, pp. XVII+396, figs. 113).—A treatise on modern shop practice and methods, from the tree to the finished article.

DISEASES OF PLANTS.

The vegetable parasites of cultivated or useful plants, T. FERRARIS (*I Parassiti Vegetali delle Pianta Coltivate od Utili. Alba, Italy, 1909. Nos. 1, pp. 1-80, figs. 4; 2, pp. 81-160, figs. 16; 3, pp. 161-240, figs. 17; 1910, Nos. 4, pp. 241-320, figs. 21; 5-6, pp. 321-480, pl. 1, figs. 42; 7, pp. 481-560, figs. 15; 1911, No. 8-9, pp. 561-736, figs. 38; 1912, No. 10-12, pp. 737-944, figs. 31; 1913, [indexes], pp. 945-1032; pp. XII*).—This work, prepared for use in schools of agriculture, deals briefly with the nature of disease in plants; the history of plant pathology; the origins, causes, and progress of plant diseases; surrounding conditions favorable to the development of parasitic diseases; predisposition and the influence of cultivation; resistance and immunity; heredity and disease; effects

of diseases on plants; and natural enemies of parasites and means of their control.

More than 500 cryptogamic forms, systematically arranged, are discussed, also a few plant troubles due to phanerogamic parasites. The analytical key includes the principal groups of parasitic fungi and the work concludes with an index.

The nature of fungus diseases of plants, J. R. JOHNSTON (*Porto Rico Sugar Producers' Sta. Circ. 2* [English Ed.], pp. 25, figs. 9).—A popular account is given of the causes of fungus diseases of plants, together with notes on their effect on the hosts, methods of control, etc.

Further cultures of heteroecious rusts, W. P. FRASER (*Abs. in Phytopathology, 3* (1913), No. 1, p. 73).—The author shows that 5 of the fern rusts belonging to the genus *Uredinopsis* are heteroecious, having their aecidial stage on *Abies balsamea*.

Mycosphærella pinodes the ascigerous stage of *Ascochyta pisi*, R. E. VAUGHAN (*Abs. in Phytopathology, 3* (1913), No. 1, pp. 71, 72).—According to the author's observations and experiments, the ascigerous stage of *A. pisi* is *M. pinodes*.

Effect of the steam-formalin treatment on certain soil organisms, J. R. WINSTON (*Abs. in Phytopathology, 3* (1913), No. 1, p. 74).—The author found that with the steam-formalin treatment on soil infected with *Fusarium* from tomato and *Rhizoctonia* from potato, pathogenic organisms were killed in about one-half the time required by steam alone.

Plant diseases in Virginia in the years 1911 and 1912, H. S. REED and C. H. CRABILL (*Virginia Sta. Rpts. 1911-12*, pp. 35-50, figs. 13).—Information relating to plant diseases in Virginia is given, the data being largely compiled from blanks sent out to correspondents in different parts of the State. The data are reported according to the alphabetical arrangement of the host plants.

Review of diseases and injuries of cultivated plants, H. MORSTATT (*Pflanzer, 9* (1913), No. 4, pp. 184-194).—This is a brief account of recent injuries to cultivated plants by animals and higher parasites, as well as by various bacteria and fungi.

Helminthosporium diseases of barley in Wisconsin, A. G. JOHNSON (*Abs. in Phytopathology, 3* (1913), No. 1, pp. 75, 76).—According to the author, three diseases of barley were observed in Wisconsin during 1912, caused by *H. gramineum*, *H. teres*, and *H. sativum*.

A study of the winter resistance of the uredospores of *Puccinia coronata*, H. S. REED and F. S. HOLMES (*Virginia Sta. Rpts. 1911-12*, pp. 78-81, fig. 1).—A report is given of studies begun in 1909 to determine whether the crown rust of oats (*P. coronata*) is carried over the winter by the uredospores in the vicinity of the station. The observations reported were made on two plats of oats, one an area of volunteer summer oats, and the other a plat of winter oats. Material was collected from time to time, and the viability of the spores was determined by the hanging drop method.

The data obtained indicate that the uredospores, under natural climatic conditions, may and do retain their viability on winter oats and to a limited extent upon volunteer summer oats.

The relation of spore vitality to temperature is discussed, from which it appears that in a general way the percentage of viable spores on the winter oats corresponded to the temperature curves.

Agar culture of wheat as a means of seedling purification, D. G. MILBRATH (*Abs. in Phytopathology, 3* (1913), No. 1, p. 74).—A preliminary report is given of certain investigations on root diseases of wheat conducted at the North Dakota Station. The purpose of the work is to ascertain by pure cultures the

possibility of purifying seedlings of wheat or other cereals so that physiological or other experiments may be carried on with wheat plants that are known to be internally free from disease-producing organisms.

The possibilities of disease resistance in cabbage, L. R. JONES (*Abs. in Phytopathology*, 3 (1913), No. 1, p. 71).—Experiments for the control of diseases of cabbage have been in progress for a number of years which have failed to discover any specific remedy. On the other hand, the possibilities of developing disease-resistant strains are said to be encouraging. Plants selected from different fields showed some resistance, and when seed from these was sown in 1911 and 1912 in soil badly infected with the yellows disease a high degree of resistance was shown in every instance, the best giving 98 per cent of plants, 93 per cent of which headed.

Sclerotinia on chicory (*Rev. Hort. Belge*, 39 (1913), No. 10, pp. 187-189, pls. 2).—A description is given of a disease of chicory ascribed to *Sclerotinia* sp., said to infest ground used for beet culture. The fungus is favored in its activity by heat, humidity, and poor aeration. No curative treatment is offered, but cautious use of lime and potash fertilizers is suggested. The early removal and destruction of all affected plants is recommended.

The small lettuce *Sclerotinia*, an undescribed species, I. C. JAGGER (*Abs. in Phytopathology*, 3 (1913), No. 1, p. 74).—The author claims that the fungus described by Smith as occurring on greenhouse lettuce (*E. S. R.*, 12, p. 764) is an undescribed species clearly distinct from *S. libertiana*.

A disease of peanut plants caused by *Bacterium solanacearum*, H. R. FULTON and J. R. WINSTON (*Abs. in Phytopathology*, 3 (1913), No. 1, pp. 72, 73).—The authors claim that cross inoculations with strains of bacteria causing the bacterial wilt of tobacco have shown that this organism will produce a disease of peanut plants.

Leaf roll, curly leaf, and other new potato diseases, W. A. ORTON (*Abs. in Phytopathology*, 3 (1913), No. 1, p. 69).—The author points out some of the differentiating characteristics of *Fusarium* wilt due to *F. oxysporum*, *Verticillium* wilt caused by *V. albo-atrum*, leaf roll disease, curly leaf, rosette, etc. Descriptions are given of mosaic and streak, two potato diseases not hitherto described.

Important potato diseases, G. KÖCK (*Monatsh. Landw.*, 6 (1913), No. 7, pp. 211-214, fig. 2).—The author describes some of the more important diseases of potatoes with a view to their ready recognition in the field, such as *Phytophthora*, *Alternaria solani*, leaf roll, frizzle disease, blackleg, and yellows.

Resting mycelia of *Phytophthora* and other related species, I. E. MELHUS (*Abs. in Phytopathology*, 3 (1913), No. 1, p. 70).—Experiments are said to have shown that the mycelium in *Phytophthora* infected tubers can spread from the tuber into the sprouts when placed in a warm, saturated atmosphere, and that the stems of plants growing from such tubers may become infected from below upward. The mycelia of several other species closely related to *Phytophthora* are said to be able to function in the same manner.

Employment of flowers of sulphur as protection against potato scab and as indirect fertilizer, H. VON FEILITZEN (*Fühling's Landw. Ztg.*, 62 (1913), No. 7, pp. 231-242).—Besides an account of previous investigations by others, the author gives the result of his own experiments in employing powdered sulphur with potatoes planted in 1911 and 1912 on land previously producing scabby tubers. In case of one variety (Juhel), the results were decidedly beneficial, while in most of the others the advantage was either small or negative.

Damping-off and root rot parasites of sugar beets, H. A. EDSON (*Abs. in Phytopathology*, 3 (1913), No. 1, p. 76).—A progress report was presented of a

study of the seedling and root rot diseases of sugar beets throughout the country.

By carefully controlled experiments with pure cultures, 4 fungi have been demonstrated as causal agents in various seedling troubles. These fungi are *Pythium debaryanum*, *Aphanomyces laxus*, *Phoma beta*, and a species of *Rhizoctonia*, probably identical with that described as *Corticium vagum solani*. *P. bata* was found invariably present on beet seed, but so far it has not been isolated from the soil. The other species appear to be soil organisms and were never found on the seed.

On two species of *Heterosporium*, particularly *H. echinulatum*, W. J. DOWSON (*Mycol. Centbl.*, 2 (1913), Nos. 1, pp. 1-14, figs. 3; 2, pp. 78-88, figs. 3; 3, pp. 136-144, fig. 1).—The author states that a new species of *Heterosporium* has been found on the lower leaves of *Beta vulgaris*, and it has been named *H. beta*. It is stated also that the forms previously described as *H. beta* and *Hormotlenron* sp. are saprophytes or very weak parasites. The parasitic nature of *H. echinulatum* was again confirmed, the carnation disease being spread by conidia or spores of this fungus carried by wind or rain.

A bibliography is appended.

Notes on the fungus diseases of sugar cane in Porto Rico, J. R. JOHNSTON (*Abs. in Phytopathology*, 3 (1913), No. 1, p. 75).—The author reports upon a number of diseases of sugar cane.

Marasmius sacchari is said to be the most common sugar cane fungus in Porto Rico, having been positively identified on living cane and cane trash as well as on other plants. *Colletotrichum falcatum* is said to be found not only on cane but also on the dead petioles of the papaya. *Thielaviopsis paradoxa*, *Thyridaria tarda*, *Nectria laurentiana*, and *Spegazzinia ornata* are reported as occurring not only on cane but also on other plants. *Melanconium sacchari* is also reported to be common. Cane smut, cane rust, and the yellow gumming disease have not yet been reported as occurring in Porto Rico.

Fusarium batatatis, not *Nectria ipomœæ*, the cause of the sweet potato stem rot, L. L. HARTER and ETHEL C. FIELD (*Abs. in Phytopathology*, 3 (1913), No. 1, p. 68).—The stem rot of the sweet potato, it is said, is usually regarded as caused by *N. ipomœæ*. However, numerous inoculations, both in the greenhouse and in the field, have failed to produce the disease. Sometimes there was injury at the point of inoculation, but the fungus never entered the bundles of the stem, and attempts to isolate it from the living tissue have always failed. Another organism, however, was isolated from the fibrovascular bundles of the roots, petioles, and stem, and this was found by a large number of inoculations to cause the stem rot. The organism is a new one, and the name *F. batatatis* has been given it by Wollenweber.

Conditions influencing infection of apple leaves by *Gymnosporangium macropus*, H. R. FULTON (*Abs. in Phytopathology*, 3 (1913), No. 1, p. 72).—According to the author, inoculation tests and observations on natural infection indicate that the individual leaf passes from a condition of immunity when the leaves are very young and reaches a maximum susceptibility when they have attained about half their full size. With increasing age the leaves become less susceptible and finally immune. On twigs the infection is said to occur in zones of usually 3 to 5 infected leaves, in which there is a decrease in the amount of infection from the intermediate leaves upward and downward toward those younger and older at the time of infection.

The effect of *Gymnosporangium* on the transpiration of apple trees, H. S. REED and J. S. COOLEY (*Virginia Sta. Rpts.* 1911-12, pp. 82-90, fig. 1).—The results of studies on the transpiration of apple leaves affected with the cedar

rust fungus (*G. juniperi-virginiana*) are given. The studies were made on two varieties of apples, York Imperial and Ben Davis, and twigs and leaves on the trees in their natural position were studied.

It was found that the transpiration of the diseased leaves of both varieties of apples was in most cases less than that of the healthy ones. The percentage of water transpired by diseased leaves during the period of the experiment was 78.3 per cent for York Imperial and 72.4 per cent for Ben Davis, as compared with that of normal leaves.

It is believed that the hypertrophy of the leaf and the subsequent obliteration of intercellular space diminishes the possibility of water elimination from the interior of the leaf. The retardation of transpiration by the fungus is considered to have some significance in the study of the problems pertaining to this disease, as assimilation is diminished whenever the transpiration stream is reduced.

The effect of the cedar rust upon the assimilation of carbon dioxide by apple leaves, H. S. REED and J. S. COOLEY (*Virginia Sta. Rpts. 1911-12, pp. 91-94, fig. 1*).—By means of a Ganong photosynthometer the authors studied the carbon dioxide assimilation of leaves of York Imperial and Ben Davis apples during the summers of 1911 and 1912. It was found that the average rate of assimilation in diseased leaves was only about one-half that of normal healthy leaves, the two varieties giving almost identical results in this respect.

The fungus is said to modify the parenchyma of the leaf to such an extent as to interfere with gaseous exchange and also to diminish it by the obliteration of the stomata through the hypertrophy of the leaf.

The enzyme activities involved in certain fruit diseases, H. S. REED (*Virginia Sta. Rpts. 1911-12, pp. 51-77*).—An account is given of studies upon the enzymes produced by *Glomerella rufomaculans*, the fungus which causes the bitter rot of apples, and also on the action of the enzymes upon the host plant.

It was found that the fungus produced several enzymes, such as amylase, invertase, cytase, and inulase, which act upon carbohydrates. Zymase appeared to be lacking. Emulsin was found to be entirely an intracellular enzyme. Lipolytic enzymes were present and fairly active. The fungus produced several enzymes which act upon proteins and their constituents. Among them protease, erepsin, and amidase were demonstrated. The presence of an enzyme which splits hippuric acid into glycocholic and benzoic acid was also demonstrated. The enzymes appear to possess the ability to break down certain important constituents of the tissues upon which the fungus grows. The juice of decayed apples was found less suited to the growth of the fungus than that of sound ones of an equal sugar content. The poorer growth of the fungus on the juice of the decayed apples is thought probably due to the higher tannin content. The fungus during its growth on the substratum seems to bring about an alkaline condition.

Studies on *Phyllosticta* and *Coniothyrium* occurring on apple foliage, C. H. CRAEILL (*Virginia Sta. Rpts. 1911-12, pp. 95-115, figs. 16*).—A study of these two fungi in connection with the frog eye spot of apple leaves is reported. Investigators have considered different fungi as causing this disease, and a detailed report is given of the author's investigations on the life history of these two fungi and the results of inoculation experiments.

From his experiments the author claims that *C. pirinum* and *P. pirina* are radically different in the color of spores, germination, and cultural characters, and that each species is composed of more than one strain or subspecies. These strains, with one exception, are very much alike in morphological characteristics and they come true to type from generation to generation. The growing of any two strains together showed no tendency to sexual reproduction. None

of the strains was found parasitic on apple leaves, but they were found to follow *Sphaeropsis malorum* as saprophytes or facultative parasites.

Twig blight and blossom blight of the apple, J. L. HEWITT (*Arkansas Sta. Bul. 113*, pp. 493-505).—In this bulletin the author aims to present the results of about three years' investigation on the twig blight and blossom blight of the apple in such form as to make them available for popular use.

The cause of the disease, *Bacillus amylovorus*, is said to attack several species of plants, causing twig blights. On the apple it causes five types of injury—body canker, fire blight, twig blight, blossom blight, and collar blight. The disease is spread, particularly in case of infection of blossoms and twigs, by various insects. Attention is called to the resistance of different varieties and individual trees to attack. Chemical examinations of specimens of twigs and fruit spurs showed that there was a rather definite relation between the starch content, as shown by analyses, and the susceptibility to blight.

In a subsequent bulletin the author expects to give more detailed statements of the experiments that have led up to the present popular summary.

An unknown apple tree disease, J. L. HEWITT and H. E. TRUAX (*Arkansas Sta. Bul. 112*, pp. 481-491, figs. 14).—A description is given of a disease of apple trees which at first was thought to be of fungus origin. The disease first appears as scattered red pycnidia-like pustules on the young, smooth bark. These average about 0.5 mm. in diameter and about half as much in height. As the disease progresses the pustules become more numerous until the limb is covered, making the bark very rough. If a thin portion of the phelloderm is cut from the older areas the remaining cut surface will be seen to be spotted with numerous dark spots on the former site of the pustules.

Another form of the disease, called the scurfy type, is characterized by an irregular thickening of the phelloderm for a considerable area on the branches. This area is darkened in color, often becoming dark red or nearly black.

A characteristic condition which seems to be associated with this disease is the lack of leaves on the infested limbs. So far, however, there are but few instances where the trouble seems to have been the definite cause of the death of the trees. Examinations up to the present time have shown no organism which could be definitely considered as the cause of this trouble. The authors expect to continue their investigation as to the cause and means of control of this disease.

The greening of wood of pear trees, P. VUILLEMIN (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 5, pp. 323, 324).—Attention is called to the greening of the wood of pear trees by the fungus *Heclotium aruginescens* found on many specimens in Lower Normandy. This fungus had been previously reported occurring on the oak and beech, and also on birches, but has not hitherto been recognized as occurring on the pear tree. Its abundance on pears is held to be an indication of a weakness of the trees rather than the presence of a parasite. The greening, it is said, is often called green rot, but the designation is considered to be an improper one, as the wood remains solid and preserves its condition indefinitely, although retaining its unusual color.

Cronartium ribicola and the proscriptio of *Ribes nigrum*, F. C. STEWART and W. H. RANKIN (*Abs. in Phytopathology*, 3 (1913), No. 1, p. 73).—The authors report a severe outbreak of *Cronartium* on currants at Geneva, N. Y., in 1912. The black currant seems to be especially subject to attack by this fungus, and it is thought that its planting should be discouraged. See also a previous note (E. S. R., 29, p. 249).

Diseased gooseberry bushes, A. STEFFEN (*Prakt. Ratgeber Obst u. Gartenbau*, 1912, p. 183; *abs. in Mycol. Centbl.*, 2 (1913), No. 3, p. 172).—The author gives the results of his study of the American gooseberry mildew fungus, which is

said to have so diminished the vitality and stores of material in the buds that in the following year (1912) only weak shoots or none at all appeared. He recommends the use of well-rotted manures about the plants and the removal of all twigs found to be affected.

Report of the plant pathologist, G. L. FAWCETT (*Porto Rico Sta. Rpt. 1912*, pp. 31-33).—Notes are given of investigations on diseases of bananas, citrus fruits, coffee, and coconuts.

The investigations on banana diseases seem to indicate that the fungi associated with some of the more common diseases are not actually parasitic but are able to attack old or weakened plants.

The citrus fruit disease reported upon is the anthracnose. The author's investigations seem to indicate that the wounds caused by scale or other insects favor the spread of the fungus causing this disease.

Notes are given on the West Indian coffee disease due to *Stilbella flavid*, and an investigation is in progress to determine if possible other forms of the fungus which are believed to be on other host plants. A new root rot of coffee, which differs somewhat from the common type, is briefly noted.

The coconut disease described is that due to *Thielaviopsis ethacetica*, and is said to result in considerable injury to the foliage.

Black pit of lemon, C. O. SMITH (*Abs. in Phytopathology*, 3 (1913), No. 1, p. 69).—The author has given a description of a bacterial disease of lemons, due to *Bacterium citripitule* n. sp. The organism has been isolated, and successful artificial inoculations have been made with it on lemons, limes, oranges, and grape fruit.

The American Botrytis blight of peonies, H. H. WHETZEL and J. ROSENBAUM (*Abs. in Phytopathology*, 3 (1913), No. 1, p. 70).—This disease, which is said to have first become epidemic in the eastern United States in 1897, is characterized by the rotting of the stems at the base soon after they appear in the spring, followed later by the blasting and rotting of the unopened buds and the blighting of the leaves. The identity of the organism causing the disease has not been definitely determined, but it is not considered identical with *B. pæonia*. The parasite is believed to pass the winter in sclerotial form in the old stems or stubble, primary infections arising from conidia produced in the spring.

Attack of cultivated roses by *Peronospora sparsa*, A. BRETSCHNEIDER (*Österr. Gart. Ztg.*, 7 (1912), No. 6, pp. 223-226; *abs. in Ztschr. Landw. Versuchsw. Österr.*, 15 (1912), No. 12, p. 1305).—Hothouse roses in lower Austria were severely attacked by *P. sparsa*, which was successfully treated with copper sprays.

The diseases of the sweet pea, J. J. TAUBENHAUS (*Abs. in Phytopathology*, 3 (1913), No. 1, p. 70).—Additional observations are given on the sweet pea anthracnose due to *Glomerella rufomaculans* (E. S. R., 28, p. 444). The mosaic disease and damping-off due to *Rhizoctonia* and *Sclerotinia libertiana* are reported attacking sweet peas under glass as well as out of doors. A root rot of sweet peas, due to *Thielavia basicola*, is also reported for the first time in this country. A mildew, possibly due to *Erysiphe polygoni*, is recorded as troublesome to sweet peas grown under glass.

The Thielavia disease of violets, D. REDDICK (*Abs. in Phytopathology*, 3 (1913), No. 1, p. 74).—Serious damage to violets in commercial and private houses is reported as due to *T. basicola*. The roots become infected and are rotted off at the point of attack. The presence of the disease is said to be usually manifest by the peculiar yellowing and slight curling of the foliage. The runners and leaf petioles are said to become infected, and in this condition the disease is usually spoken of by growers as the black rot disease. Plants

grown from diseased cuttings are dwarfed and bear an inferior quality of flowers, although the quantity may be greater than from healthy plants.

Some field experiments with the chestnut canker fungus, W. H. RANKIN (*Abs. in Phytopathology*, 3 (1913), No. 1, p. 73).—The average rate of growth of artificially produced cankers during the summer months was found to be 1.88 cm. per month. The conidia were observed about one month after inoculation. The perithecial stromata were never formed until late in the summer even in the case of infections produced early in the spring. Mature perithecia were commonly observed by the middle of November in all cankers produced by inoculations made even as late as August 1. Ascospores were found to be ejected only when free water was present on the stromata, and it is stated that they may be found at any time during the year. The water content of the tree as observed in 1912 did not alter the susceptibility of the tree to the fungus. It was found that slow growing cankers could be produced on certain species of oaks. *Endothia virginiana* is said to be not pathogenic on the chestnut in New York.

Twig tuberculosis of the Italian cypress, F. W. NEGER (*Mycol. Centbl.*, 2 (1913), No. 3, pp. 129–135, figs. 6).—A description and discussion are given of a disease of Italian cypress, in the twig swellings of which a parasitic mycelium is found. It is thought to be possible that this disease of cypress may be due to the same cause as the twig swellings of *Juniperus phoenicea*, the cause of which is in dispute.

Fungicides, their preparation and application, A. SHARPLES (*Agr. Bul. Fed. Malay States*, 1 (1913), No. 11, pp. 392–398).—Formulas are given for making, also detailed directions for handling and using, several fungicides based upon copper or sulphur.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The control of prairie dogs and ground squirrels, M. H. SPAULDING (*Montana Sta. Circ.* 20, pp. 9–26, figs. 2).—A popular discussion of these pests, their natural enemies, and means of eradication. It is stated that the loss in different parts of the State due to the depredations of small rodents has been very great.

The war against field mice in France, J. BOYER (*Sci. Amer.*, 109 (1913), No. 6, pp. 114, 118, figs. 5).—This article describes the methods used in combating field mice, principally *Arvicola agrestis* and *Mus sylvaticus*, in France.

The rat, its habits and their relation to antiplague measures, R. H. CREEL (*Pub. Health Rpts. [U. S.]*, 28 (1913), No. 9, pp. 382–386).—The experiments here reported relate to swimming, burrowing, climbing, jumping, preference for food, and cannibalism of *Mus norvegicus*, *M. rattus*, and *M. alexandrinus*.

Note on leprosy in rats, J. R. RIDLON (*Pub. Health Rpts. [U. S.]*, 28 (1913), No. 28, pp. 1447, 1448).—Three of 5,700 rats collected at Mayaguez, P. R., from August 29 to December 30, 1912, and examined for plague infection were found to be suffering from leprosy.

Fumigation of vessels for the destruction of rats, S. B. GRUBBS and B. E. HOLSENDORF (*Pub. Health Rpts. [U. S.]*, 28 (1913), No. 25, pp. 1266–1274).—The fumes of burning sulphur are said to be the most convenient and efficient fumigant for the destruction of rats in vessels.

The economic importance of the little owl in England (*Abs. in Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 10, pp. 2320, 2321).—It is concluded that the little owl (*Athene noctua*), which was introduced into England some 30 or more years ago, may be considered as a beneficial species.

An annotated list of the literature on insects and disease for the year 1912. R. W. DOANE (*Jour. Econ. Ent.*, 6 (1913), No. 4, pp. 366-385).—An annual summary in continuation of that previously noted (E. S. R., 28, p. 155).

Tenth annual report of the state entomologist of Montana, R. A. COOLEY (*Montana Sta. Bul.* 92, pp. 49-67, figs. 2).—This report consists of brief accounts of the occurrence of insect pests and the spotted fever tick in Montana in 1912. Several of the common pests are said to have been more than normally abundant. In the lower Yellowstone Valley there was an outbreak of grasshoppers; in the sugar-beet district the sugar beet webworm was alarmingly abundant; while over the entire State the Colorado potato beetle, the apple aphid, and cutworms occurred in more than usual numbers.

Report of the entomologist, C. W. HOOKER (*Porto Rico Sta. Rpt.* 1912, pp. 34-38).—The occurrence of the more important insect pests, including local outbreaks of the cabbage worm (*Pontia monuste*), the bean leaf roller, bean leaf beetle (*Cerotoma trifurcata*), corn earworm, fall army worm, cucumber beetle (*Diabrotica vittata*), *D. graminea*, *Bostrychus monachus*, and *Agati grandiflora*, is reported upon.

Of the insect enemies of coffee mention is made of an ant (*Myrmelachista ambigua ramulorum*) as being the most troublesome pest. This ant lives mostly in twigs and under pieces of loose bark on the trunk of the guamá, which is grown as a shade tree, and in dead wood on the coffee. Two coccids, a mealy bug (*Pseudococcus citri*) and a pink scale, are attended by it. The coccids are carried by the ants into canals eaten out along the pith of the smaller new growth which will bear the next season's fruit. The growth is weakened to such an extent that when bent down by the pickers at the next harvest it breaks easily and much fruit is lost, and the pickers are considerably annoyed by the ants. A native ant is said to drive this coffee ant away and occupy its nests but because of its sting pickers consider it worse than the coffee ant. The coffee leaf miner (*Leucoptera coffeella*), though parasitized by two chalcidids, is abundant throughout the island, no effective treatment having been discovered. A lepidopterous borer (*Psychonotua* sp.), previously reported by Tower in 1908 (E. S. R., 22, p. 252) as boring in orange, citron, rose apple, and sweet almond, was the source of considerable injury. The coffee weevils are said to be confined to certain hill districts where they cause considerable injury. In the western part of the island a tachinid (*Cryptomeigenia* sp.) parasitizes the May beetles and in some cases is thought to be an effective check.

Under the heading of fruit flies mention is made of a species of *Anastrepha*, closely related to *A. acidusa* and thought to be *A. fraterculus*, which breeds so commonly in one of the native mangoes that it is difficult to obtain sound fruit from some trees. In addition it attacks some of the introduced Indian species, as the Cambodiana, and also guava, jobo amarillo, and jobo de la India fruit. The lechosa fruit fly (*Toxotrypana curvicauda*) is said to be abundant in Mayaguez. The eggs are laid well below the surface of the green fruit; 2 to 15 or more larvæ mature within the fruit, and when it drops pupate 1 or 2 in. below the surface of the ground immediately below the fruit. Adults emerge in 17 to 21 days, and eggs for another brood are soon laid. The larvæ in jobo are commonly attacked by 2 hymenopterous parasites, *Opius* (*Utetes*) *anastrepha* n. sp. and *Ganaspis* n. sp.

Directions are given for the propagation of the Japanese beetle fungus *Metarrhizium anisoplia*, which was introduced by the station some time ago from Hawaii. A colony of lady beetles (*Cryptolamius montrouzieri*) was distributed to sugar and pineapple growers as an aid in controlling the mealy bug (*P. citri*), and a colony of aphid-feeding lady beetles (*Hippodamia con-*

vergens) was introduced from California and freed at various points in Mayaguez.

Experiments conducted with cement bee hives and stands promise good results. "For the past year the weight of 2 hives has been taken regularly night and morning to determine the amount of honey stored by a single swarm. One 10-frame hive with 4 supers made 357 lbs.; a second, with 2 supers, made 539 lbs. The largest amount stored in one day by a single hive was 12 lbs. The average for one swarm was 1.48 lbs., and for another slightly less than a pound."

Eighth annual report of the state entomologist and plant pathologist for 1912, G. M. BENTLEY (*Ann. Rpt. State Ent. and Plant Path. Tenn.*, 8 (1912), pp. 64, figs. 13).—This report deals with the strawberry root louse (*Aphis forbesi*), found doing considerable damage to strawberry plants for the first time in Tennessee, nursery inspection, cotton boll weevil quarantine for Tennessee, present status of the cattle tick situation in Tennessee, etc.

Report of the state entomologist, G. M. BENTLEY (*Tennessee Sta. Rpt. 1912*, pp. 60–65, fig. 1).—An abridgment of the above.

[Entomological notes], C. R. JONES (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 5, pp. 246–250).—These notes relate to bagworms, ants (*Solenopsis geminata*) injurious to okra, several tobacco insects, mechanical and natural control of insects, occurrence of the coconut weevil (*Rhynchophorus ferrugineus*), and plants resistant to insect attack.

Annual report for 1912 of the zoologist, C. WARBURTON (*Jour. Roy. Agr. Soc. England*, 73 (1912), pp. 289–296).—A brief account of the occurrence of forest tree pests, animal parasites, farm and garden pests, and fruit pests, with miscellaneous notes.

The fauna of the German colonies, G. AULMANN (*Fauna Deut. Kolon. [Berlin Zool. Mus.]*, 5. ser., 1911, Nos. 1, pp. 32; 2, pp. 98, figs. 61; 1912, Nos. 3, pp. 86, figs. 57; 4, pp. 166, figs. 120; rev. in *Agr. Jour. India*, 7 (1912), No. 4, pp. 411, 412; 8 (1913), No. 1, p. 96).—This work provides an account of the insect pests of all the German colonies, primarily for the use of officials and planters who may be called upon to deal with their damage and means of prevention. The first part gives a brief description of the principal groups of insects, their life histories, methods of collecting and preserving, a short list of insecticides with formulas for their preparation, etc. Part 2, by Aulmann and W. La Baume, gives a descriptive list of the insects which attack coffee, part 3 contains a similar description of the insects attacking cacao, and part 4 is devoted to the insect enemies of the cotton plant.

Insect pests of the household, R. D. WHITMARSH (*Ohio Sta. Bul. 253*, pp. 103–153, figs. 47).—This is a popular account of the more important household insects and means for their control.

Soil-infesting insects, T. J. HEADLEE (*New Jersey Stas. Circ. 26*, pp. 2–8).—A brief popular discussion of wireworms, white grubs, and cutworms.

A probable parasite of *Scapteriscus didactylus* in Cuba, P. CARDIN (*Jour. Econ. Ent.*, 6 (1913), No. 3, pp. 330, 331).—In addition to the fire ant (*Solenopsis geminata*) and the common red ant (*Pheidola megacephala*), which are important enemies of the mole cricket or changa (*Scapteriscus didactylus*) in high and dry land in Cuba, the author has found a cocoon of an undetermined hymenopteran which appears to parasitize this pest.

A successful trap for cockroaches, F. L. WASHBURN (*Jour. Econ. Ent.*, 6 (1913), No. 3, pp. 327–329, fig. 1).—This paper describes and illustrates a simple trap, devised by S. A. Graham for catching cockroaches, which has been used with much success in Minnesota.

The chinch bug situation in Kansas, G. A. DEAN and J. W. MCCOLLOCH (*Kansas Sta. Circ. 29*, pp. 8, figs. 3).—This circular explains the measures by

which chinch bugs may be prevented from spreading from infested to uninfested fields.

A note on two elm leaf aphids, EDITH M. PATCH (*Jour. Econ. Ent.*, 6 (1913), No. 3, pp. 316-318, figs. 8).—The author here calls attention to the fact that 2 perfectly distinct and easily distinguishable species causing elm leaf curl are present in the United States. One of these migrates to *Pyrus* and *Cratægus* where it is known as the woolly aphid of the apple; this species extends from the Atlantic to the Pacific coast. The second elm leaf species, which is present in California and elsewhere in the Pacific States, appears to be identical with a species recorded from England, Germany, Sweden, and elsewhere which has been ascertained by European workers to migrate from *Ulmus* to *Ribes* and is at present known as *ulmi* (*fodiens*) of Europe.

Aphid pests of Maine, II, EDITH M. PATCH (*Maine Sta. Bul.* 213, pp. 73-100, pls. 4, figs. 26).—Continuing previous work (*E. S. R.*, 28, p. 60) this bulletin deals with 16 species occurring on willows (*Salicacæ*) of which 3, namely, *Pemphigus gravicornis*, *Chaitophorus delicata*, and *Melanoxantherium antennatum*, are described as new. A brief discussion of aphid control follows (pp. 91, 92). Part 2 of a Food Plant Catalogue of the Aphidæ of the World, which lists the aphids attacking members of the willow family, is appended (pp. 93-100).

Preliminary report on the parasites of Coccus hesperidum in California, P. H. TIMBERLAKE (*Jour. Econ. Ent.*, 6 (1913), No. 3, pp. 293-303).—While formerly one of the worst scale pests to citrus fruit in California, at the present time *C. hesperidum* it is of minor importance. Mention is made of a serious infestation which occurred at Riverside, Cal., in the heart of a small tract overrun by the Argentine ant (*Iridomyrmex humilis*), which it is thought may have been brought about by their being attended by this ant.

Five species of parasites of the soft scale are said to have been observed in California during the past 2 years, which in the order of their probable effectiveness, are as follows: *Aphycus* sp. near *flavus*, *Microterys flavus*, *Coccophagus lecanii*, *C. lunulatus*, and *Aphycus* n. sp. near *coquilletti*. The *Microterys* and sometimes *Aphycus* also are said to be attacked by no less than 8 hyperparasites.

Scale insects upon citrus trees and methods to be employed for their control, L. H. GOUGH (*Agr. Jour. Egypt*, 1 (1912), No. 2, pp. 89-93, pl. 1).—Several scale insects which occur in Egypt, particularly the Florida red scale (*Aspidiotus aonidium*) and the California red scale (*A. aurantii*), are the source of considerable injury.

Icerya purchasi in the Department of Alpes-Maritimes, E. MOLINAS (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 20, pp. 625-629, figs. 9).—This is a brief discussion of the occurrence of the cottony cushion-scale, which was first discovered in this Department in February, 1911.

Insect pests of the New Zealand flax (Phormium), C. FRENCH, JR. (*Jour. Dept. Agr. Victoria*, 10 (1912), No. 12, pp. 720, 721, figs. 2).—The white mussel scale (*Phenacaspis cugenia*) and the ivy or oleander scale (*Aspidiotus hederæ*) are the insects considered.

A brief report on the piojo blanco of cotton, C. H. T. TOWNSEND (*Jour. Econ. Ent.*, 6 (1913), No. 3, pp. 318-327).—This paper deals with the white scale (*Hemichionaspis minor*), an account of which by the author has been previously noted (*E. S. R.*, 28, p. 159). This scale has developed since 1905 into a serious pest of cotton in the Department of Piura, Peru.

The present paper deals with its arrival and spread; conditions encountered in Piura, including enemies; importation, liberation, and distribution of enemies; enemy work for the future; cultural control measures; estimated capacity for damage in Piura; and a piojo blanco quarantine.

The Phoenix skipper (*Pamphila dysmephila*), A. KELLY (*Agr. Jour. Union So. Africa*, 4 (1912), No. 6, pp. 876-883, figs. 7).—An account is given of the life history and habits of *P. dysmephila*, which defoliates the native palm (*Phoenix reclinata*).

Hypolycæna philippus, an enemy of pineapples in Sao Paulo, Brazil, G. BONDAR (*Bol. Min. Agr., Indus. e Com. [Brazil]*, 1 (1912), No. 4, pp. 103, 104, pl. 1; *abs. in Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 4, p. 666).—The caterpillars of this lycaenid butterfly are said to perforate pineapples in order to reach the interior, where they live on the pulp and eject their excrements through the holes they have made.

Sericulture in the valley of the Yalung, A. F. LEGENDRE (*Bul. Econ. Indochine, n. ser.*, 16 (1913), No. 100, pp. 80-105).—A somewhat detailed account, including a brief discussion of the diseases of the silkworm, and of the mulberry and its diseases, etc.

The apple tree tent caterpillar (*Malacosoma (Clisiocampa) americana*), W. E. BRITTON (*Connecticut State Sta. Bul.* 177, pp. 3-20, figs. 16).—This popular account deals with the life history and habits of the apple tree tent caterpillar, insects mistaken therefor, natural enemies, injury, remedial and control measures, etc. This insect was unusually abundant in Connecticut in 1913, the outbreak covering the entire State except for certain localities along the coast.

Fall army worm (*Laphygma frugiperda*), J. A. DEW (*Jour. Econ. Ent.*, 6 (1913), No. 4, pp. 361-366).—The author presents in condensed form the results of investigations and experiments conducted at the Alabama College Station from May to December, 1912, including seasonal and life histories, natural enemies, and control measures.

The fight against the *Cochylis* moth, MOREAU and VINET (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 33 (1912), Nos. 15, pp. 461-470; 16, pp. 492-499; 17, pp. 517-524).—This discussion of the work carried on in combating *Cochylis ambiguella* in France includes observations relating to its biology and the effect of heat, drying, and various insecticides upon it.

The control of *Polychrosis botrana* in Switzerland in 1912, H. FAES (*Terre Vaud.*, 5 (1913), No. 7, pp. 67-69; *abs. in Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 4, pp. 663, 664).—The author reports having had excellent results in 1912, both in the laboratory and the vineyard, from the application of a solution of soft soap and pyrethrum powder made at the rate of 20 lbs. of the former to 15 lbs. of the latter in 100 gal. of water.

Unspotted tentiform leaf miner of the apple (*Ornix geminatella*), L. HASEMAN (*Jour. Econ. Ent.*, 6 (1913), No. 3, pp. 313-316).—This insect is said to have been exceedingly abundant for the past 2 or 3 years throughout the apple sections of Missouri, during which time the author has been studying its relation to horticulture in the State.

In the vicinity of Columbia it invariably passes the winter in the pupal stage protected by a rather firm cocoon which is made somewhere along the edge of the leaf late in the fall. After the first heavy frosts come the leaves containing the pupæ fall to the ground where they remain throughout the winter. In 1912 the first moths began to emerge in the insectary on April 17 and on May 3 they were fairly abundant in the orchard. The life cycle is said to be completed in from 4 to 5 weeks and 5 fairly distinct broods were noted during the summer.

The flour moth and its control, L. D. CLEARE, JR. (*Jour. Bd. Agr. Brit. Guiana*, 6 (1913), No. 3, pp. 130-137).—Investigations at Georgetown have shown the Mediterranean flour moth (*Ephestra kuehniella*) to be present in a number of buildings and to be especially partial to oats.

Gouty pine midge (*Itonida inopis*), E. P. FELT (*Jour. Econ. Ent.*, 6 (1913), No. 3, p. 331).—Observations indicate that under certain conditions this midge may be of some economic importance, even though its host plant, the scrub pine (*Pinus rigida*), is not one of the most valuable trees.

Device for detecting flight of mosquitoes, L. E. HASKELL (*Sci. Amer.*, 109 (1913), No. 5, p. 102, fig. 1).—This is a description of an instrument invented by E. F. Quimby which has been used with success in the Isthmian Canal Zone. The device consists of a metal frame holding 4 glass plates, each 12 by 12 in. in size, placed at right angles to one another upon a tripod. In order to catch the mosquitoes a coat of tanglefoot composed of $\frac{1}{2}$ lb. of rosin to 1 liter of castor oil is prepared, and when applied to the glass is practically transparent.

Determining the flight of mosquitoes, J. ZETEK (*Ann. Ent. Soc. Amer.*, 6 (1913), No. 1, pp. 5-21, figs. 4).—A general discussion of methods.

The yellow-fever mosquito (*Aedes calopus*), L. O. HOWARD (*U. S. Dept. Agr., Farmers' Bul.* 547, pp. 16, figs. 6).—This popular account discusses the domesticity of the species, habits of the adult, breeding habits, geographical distribution, etc.

The reduction of domestic flies, E. H. ROSS (*London, 1913*, pp. VIII+103, pls. 15, figs. 2).—This work discusses such topics as the importance of domestic flies, their life history, habits, and enemies, how to reduce flies, and sanitary education.

The sheep maggot fly pest in Australia, W. W. FROGGATT and W. F. COOPER (*Watford, England: Cooper Lab. Econ. Research, 1913*, pp. XI+88, figs. 18).—This work consists of 4 parts. Part 1 presents a general summary of scientific information on blow flies, including their biology and natural enemies. Part 2, by W. W. Froggatt (pp. 10-48), deals with the maggot fly in sheep, including symptoms and method of infestation, the flies that cause the damage, blow flies including the genera *Calliphora*, *Lucilia*, and *Ophyra*, the causes that have led to scavenger or flesh flies becoming parasites, docking the tails of lambs, methods of control, etc. (See also a previous note, *E. S. R.*, 24, p. 757.) Abstracts of papers by J. L. F. Woodburn (pp. 49-54) and by A. E. McLeod and J. B. Holme (pp. 55, 56) then follow. Part 3 (pp. 57-72) is devoted to remedial measures, and part 4 (pp. 73-75) takes up the question of when is the pest most serious. A list of authors of essays on the subject and specimens received, a bibliography of the more important papers, and an index are appended.

A historical account on the use of kerosene to trap the Mediterranean fruit fly (*Ceratitis capitata*), H. H. P. and H. C. SEVERIN (*Jour. Econ. Ent.*, 6 (1913), No. 4, pp. 347-351, fig. 1).—The authors first present the results of experiments carried on in attempting to control the Mediterranean fruit fly by means of kerosene traps, and then give a historical account of the method of control as practiced or recommended in various parts of the world.

"The attempt on our part to control the Mediterranean fruit fly by the use of kerosene traps wired to fruit trees was a complete failure. In one experiment 10 traps were wired in 10 fruit-bearing citrus trees located in different parts of an orchard and in 5 weeks, 10,239 fruit flies were captured; of this entire number only 36 were females, the remainder being males. At the end of the 5 weeks nearly every ripe orange in this orchard had been 'stung' by the pest."

Fruit fly control, W. R. WINTER (*Bermuda: Dept. Agr., 1913*, pp. 14; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 5, p. 164).—The author gives a brief statement of the life history of and damage done by *Ceratitis capitata*, with a list of 45 trees attacked by the fly, to which grapes and mulberries must occasionally be added. The most efficient control in Bermuda has been found to lie

in the destruction of the broods by careful and thorough removal of all infested fruit.

It is stated that the South African granadilla (*Passiflora edulis*), which in Bermuda fruits after the loquat and before the peach, forms an excellent trap fruit when grown on scaffolds or fences near the fruit trees. The fruit fly oviposits freely in the fruit where the eggs become encysted in the rind and never hatch. Experiments conducted at the Bermuda Agricultural Station in the autumn of 1912 with fruit and imitation fruit coated with tanglefoot were most successful, especially after the bulk of the sweet oranges had been gathered. The tanglefoot used was made by dissolving 2½ parts by weight of powdered resin and 1 part by weight of castor oil, then heating and stirring well.

Mally fruit fly remedy: A demonstration of its applicability in towns, C. P. LOUNSBURY (*Agr. Jour. Union So. Africa*, 5 (1913), No. 4, pp. 570-574).—This is a report of the demonstration of the applicability of sweetened arsenicals in combating the fruit fly, based upon tests made under the conditions that prevail in the city of Pretoria.

The Peruvian fruit fly (*Anastrepha peruviana* n. sp.), C. H. T. TOWNSEND (*Jour. Econ. Ent.*, 6 (1913), No. 4, pp. 345, 346).—The fruit fly here characterized for the first time is said to be a general fruit pest in Peru, attacking not only deciduous fruits but citrus fruits as well. "The injury seems most acute during the month of February, at the time when the peaches, guavas, cherimoyas, and other fruits are largely ripening. . . . Peach and guava trees are often so completely infested that it is impossible to find a single sound fruit on the tree at times during February."

A synopsis of the dipterous groups *Agromyzinæ*, *Milichiinæ*, *Ochthiphiinæ*, and *Geomyzinæ*, A. L. MELANDER (*Jour. N. Y. Ent. Soc.*, 21 (1913), No. 3, pp. 219-273).—This paper includes tables for the separation of the subfamilies, genera, and species.

Notes on the bean fly (*Agromyza phaseoli*), E. JARVIS (*Queensland Agr. Jour.*, 30 (1913), No. 2, pp. 124, 125).—*A. phaseoli* is reported to be the source of serious injury to French beans in southern Queensland.

The Chrysomelidæ and Coccinellidæ of the Philippines, II, J. WEISE (*Philippine Jour. Sci., Sect. D*, 8 (1913), No. 3, pp. 215-242).—This continuation of the paper previously noted (E. S. R., 24, p. 563) deals with 71 species of Chrysomelidæ and 4 of Coccinellidæ, of which 23 of the former and 2 of the latter are described as new to science. Three species of Chrysomelidæ from Java and one from Borneo are also characterized for the first time.

A new host plant of the California grape root worm (*Adoxus obscurus*), E. J. BRANIGAN (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 7, pp. 585, 586).—*Saxifraga peltata*, which grows in abundance along the borders of swift running streams in the high Sierras, has been found by the author to serve as a host plant for the grape root worm.

The branch and twig borer (*Polycæon confertus*), E. O. ESSIG (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 7, pp. 587-589, fig. 1).—A brief account of the injury caused by this borer. It is stated that this beetle is not likely to continue to be destructive enough in any one locality for a period of years to warrant the expense of control.

A contribution to the habits of *Otiorhynchus rotundatus*, H. VON SENDERKEN (*Ztschr. Wiss. Insektenbiol.*, 9 (1913), No. 1, pp. 7-12, fig. 1; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 4, p. 121).—In the vicinity of Danzig this beetle is a very common enemy of *Syringa vulgaris*.

A new insect pest to roses, "the vine curculio" (weevil), C. FRENCH, JR. (*Jour. Dept. Agr. Victoria*, 11 (1913), No. 4, pp. 240, 241, fig. 1).—The vine

curculio (*Orthorrhinus kluggi*), which has in recent years caused considerable loss to vineyardists, is said to have commenced to attack roses.

The Anthonomus of the raspberry and strawberry (*Anthonomus rubi*) (*Jour. Bd. Agr. [London]*, 19 (1912), No. 5, pp. 394-396).—A brief account of this weevil, which is chiefly an enemy to plants of the genus *Rubus*. In Europe it is best known because of its attacks upon the raspberry, but in England of late it has been a serious enemy to the strawberry.

Preliminary report on the picudo of cotton in Peru, C. H. T. TOWNSEND (*Jour. Econ. Ent.*, 6 (1913), No. 3, pp. 303-312).—This paper relates to studies of the Peruvian cotton square-weevil (*Anthonomus vestitus*), an account of which has been previously noted (*E. S. R.*, 28, p. 161). The present paper deals with its origin, discovery, and occurrence; response to climatic conditions; parasites and predaceous enemies; cultural control measures; longevity and period of inactivity; capacity for damage; and work for the future.

Observations on the egg parasites of *Datana integerrima*, H. M. RUSSELL (*Proc. Ent. Soc. Wash.*, 15 (1913), No. 2, pp. 91-97).—This is a report of observations made of the black walnut caterpillar at Orlando, Fla., during 1907 and 1908. Four species of parasites, namely, *Trichogramma minutum*, *Telenomus sphingis*, *Baryscapus* sp., and *Ooencyrtus* sp., were reared from the eggs of *D. integerrima* in September and October, 1907. From 10,926 eggs collected in September and October, 1907, 3,924 larvæ hatched, 6,365 parasites were reared, and 637 eggs remained unhatched. *Telenomus sphingis* was the most abundant of the parasites.

***Habrobracon hebetor*, a confederate in the fight against the Mediterranean flour moth**, J. BUCHWALD and E. BERLINER (*Ztschr. Gesam. Getreidew.*, 2 (1910), No. 1, pp. 1-4, pl. 1).—A brief discussion of this braconid parasite, which has been found by the author to occur in Germany. It has also been recorded from England, France, Australia, and this country.

Some observations on the habits and reproduction of *Habrobracon hebetor*, the Mediterranean flour moth parasite, E. BERLINER (*Ztschr. Gesam. Getreidew.*, 3 (1911), No. 11, pp. 245-248).—Brief notes on the biology of this parasite.

Some methods of handling minute hymenopterous parasites, T. E. HOLLOWAY (*Jour. Econ. Ent.*, 6 (1913), No. 4, pp. 341-344).—The author describes the methods which he has successfully employed in rearing and shipping the egg parasites *Trichogramma minutum* and *Telenomus* sp., probably *heliothidis*.

Report of the assistant entomologist, E. C. COTTON (*Tennessee Sta. Rpt. 1911*, pp. 182, 183).—This report consists largely of a brief statement of the work with the cattle tick (*Margaropus annulatus*).

In pathogenicity tests but slight attacks of Texas fever could be produced during the colder season of the year by applying seed ticks reared from eggs laid by ticks which had become engorged on immune young stock. Symptoms of Texas fever appeared on the eleventh day in 2 aged cows upon which seed ticks from adults engorged on immune cattle at Baton Rouge, La., had been placed. On the thirteenth day 200 cc. of trypanblue was injected into one of the cows and repeated after a short interval. On the fourteenth day 200 cc. of trypanblue was injected into the second cow. Since the first cow died on the sixteenth day and the second on the eighteenth day, it appears that the drug can not be depended upon to cure this disease.

Report of the assistant entomologist, E. C. COTTON (*Tennessee Sta. Rpt. 1912*, pp. 65, 66).—This report consists in large part of a description of a rearrangement made of the temperature control plant, an account of which has been previously noted (*E. S. R.*, 23, p. 657).

Rocky Mountain spotted (or tick) fever.—Sheep grazing as a possible means of controlling the wood tick (*Dermacentor andersoni*) in the Bitter

Root Valley, L. D. FRICKS (*Pub. Health Rpts. [U. S.]*, 28 (1913), No. 32, pp. 1647-1653).—In the experiment carried on, over 87 per cent of 295 ticks placed in the wool of unshorn sheep were recovered dead, as were the majority of the ticks recovered from sheep grazing naturally over tick-infested territory. Many of the engorged females recovered appeared not to have been fertilized, and comparatively few ticks, either alive or dead, were found on the sheep after they had been sheared.

"It is believed that these findings warrant the continuation of the experiment by the placing of a band of 2,000 wethers on some selected range west of the Bitter Root River as early in the spring as possible. The selected range should be closely grazed until shearing time, and then, if desired, the sheep could be sheared, dipped, and transferred to the east side of the valley without danger of carrying wood ticks, or returned immediately to the range until the experiment is completed.

"Four factors are to be considered in the sheep-grazing experiments: First, the removal of undergrowth and the consequent destruction of 'good tick country' by close grazing; second, the destruction or removal of other mammals, domestic and wild, from the sheep range; third, the destruction of ticks themselves by the grazing sheep; fourth, the placing of the problem of tick eradication on an industrial basis."

Rhizoglyphus echinopus as an orchid pest, **M. J. SIRKS** (*Ztschr. Pflanzenkrank.*, 22 (1912), No. 6, pp. 350-356, figs. 2; *abs. in Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 10, pp. 2317, 2318).—This acarid is reported to have been the cause of alterations of the roots and the bases of leaves of orchids at Leyden.

FOODS—HUMAN NUTRITION.

Analysis and value of concentrated or condensed chicken soup, L. A. CONGDON (*North Dakota Sta. Spec. Bul.*, 2 (1913), No. 15, pp. 246-256, fig. 1).—In the investigation here reported, an examination was made of 8 different brands of concentrated or condensed chicken soup as purchased on the market. Data are given and discussed regarding the general analysis of the products, the nature and amounts of the materials used in preparation, their food value and cost as compared with some common articles of food, the nature and properties of the fats, and the amounts of chicken and beef present.

Comparison with 2 standard recipes for chicken soup showed, in the opinion of the author, that the soups in many cases contained excessive amounts of boiled rice which had been substituted for chicken, and that beef and beef extract were also substituted for chicken and chicken extract in some of the products. The meat fiber detected ranged from 2.2 to 15.2 per cent, averaging only 8.1 per cent.

Researches on frozen meat, V. ASCOLI and S. SILVESTRI (*Arch. Farmacol. Sper. e Sci. Aff.*, 14 (1912), No. 6, pp. 229-244).—In the frozen condition, meat undergoes slight changes, probably due to the action of enzymes, and which consist chiefly of an increase of soluble protein, the development of a peculiar flavor, and a decrease in the aromatic odor of the broth.

The use of preservatives with fish, POUCHET (*Rec. Actes Off. et Doc. Hyg. Pub., Trav. Cons. Sup. Hyg. Pub. France*, 40 (1910), pp. 507, 508).—In this report concerning the use of boric acid to preserve fish during shipment, it is recommended that the use of this substance be prohibited.

The chemical composition of cooked vegetable foods, III, KATHARINE I. WILLIAMS (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 8, pp. 653-656).—In continuation of work previously noted (*E. S. R.*, 19, p. 259), analytical data are

reported concerning the losses during cooking and the chemical composition of the edible portion of a number of cooked cereals and vegetables.

Studies of the digestibility of several different kinds of bread, M. HINDHEDE (*Skand. Arch. Physiol.*, 28 (1913), No. 4-6, pp. 165-188).—The results of the experiments here reported show, in the opinion of the author, that rye and wheat breads made from unsifted flour are more economical as food than those made from sifted flours.

Bakers' bread, P. RICHARDS (*Chicago, 1913, 3. ed., pp. 121, pl. 1*).—This book is designed for the use of bakers and contains numerous recipes for making a great variety of plain and fancy breads and rolls. Short discussions are given of different kinds of flour and their use and of the preparation and use of bakery yeasts.

Oats in human diet, L. F. MOREAU (*Bul. Soc. Agr. France, 1913, May 15, Sup., pp. 513-518*).—This article discusses the value of oats in the diet, with special reference to their efficiency and economy as a food for soldiers. Some analyses, but no experimental data, are reported.

Extraction, cleaning, and utilization of nut kernels, C. GROUND (*Chimiste, Lab. et Usine [Brussels], 4 (1913), pp. 27-29; abs. in Chem. Abs., 7 (1913), No. 13, p. 2260*).—According to the author, soaking yellow and rancid kernels 1 hour in a 5 per cent solution of tannic acid or of citric acid improves them, though the latter imparts a flavor and tends to fermentation. Exposure to sulphur dioxide for 6 to 10 hours, after immersion in 1 per cent citric acid solution, is said to bleach and preserve the kernels.

Diabetic foods, J. P. STREET (*Connecticut State Sta. Rpt. 1913, pt. 1, pp. 95+VII*).—The results are given of an extended study of commercial food materials which are claimed to be specially valuable to the diabetic, since they contain very small amounts of carbohydrates. The object was to obtain information which would be valuable to the physician and the diabetic who wished to select food for a low carbohydrate diet.

Analytical data are given regarding nearly 500 samples of such products, including flours, meals, soft breads, hard breads, crackers, breakfast foods, nut foods, cocoa, chocolate preparations, wines, and saccharin products. The composition of the foods, with special reference to their carbohydrate content and their value or harmfulness as diabetic foods, is discussed extensively. Tables are given which show the foods containing less than 35 per cent of carbohydrates, and also the average carbohydrate content of ordinary food materials.

Much variation and considerable misrepresentation was discovered in these products. Thus "the purchaser of so-called gluten flours at the present time may obtain preparations containing from 87 to 11 per cent of protein and from 4 to 76 per cent of carbohydrates, at a cost of from 9 cts. to \$1.56 per pound. . . . Proper protection of the diabetic demands that the manufacturer of these flours should be required to state on the label the guaranteed percentages of both protein and carbohydrates."

Similar conclusions were reached as to other foods. See also previous work (*E. S. R.*, 28, p. 357).

Diabetic foods offered for sale in the United States, J. P. STREET (*Jour. Amer. Med. Assoc.*, 60 (1913), No. 26, pp. 2037-2039).—A summary and discussion of the above data.

Commercial chicories, E. COLLIN (*Ann. Falsif.*, 6 (1913), No. 57, pp. 371-383, figs. 9).—The preparation, structure, and microscopical appearance of chicory are described. Methods of analysis are given, with a description of the foreign substances most commonly found in chicory, together with a discussion of its adulteration.

Artificial colors used in the manufacture of food products, A. GAUTIER, BÉHAL, ET AL. (*Rec. Actes Off. et Doc. Hyg. Pub., Trav. Cons. Sup. Hyg. Pub. France*, 40 (1910), pp. 721-727).—The toxic effects of a number of different coloring materials are discussed, and a list is given of a number of dyes the use of which is permitted in producing artificial colors of food materials.

[Food analyses and other pure food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 2 (1913), Nos. 12, pp. 181-196; 13, pp. 197-228, figs. 4; 14, pp. 229-244; 15, pp. 245-260, fig. 1; 16, pp. 261-276).—In addition to analytical data regarding a number of foods and drugs, brief notes, etc., the first and fifth of these bulletins contain information regarding the inspection of restaurants, confectionery stores, and bakeries, score cards used in the inspection of each of these being given.

In the second bulletin the results are presented and discussed of a series of baking and milling tests carried out to determine the effect of sprouted wheat on the milling and baking qualities of an average No. 2 Northern wheat, from which the conclusion is drawn that a sprouted wheat which has been dried and kept in good condition may be present in quantities up to 10 per cent without producing any bad effects upon the quality of the flour. A discussion of the invisible loss in milling, by T. Sanderson, is included, also information concerning the sanitary inspection of grocery stores and the score card used in this work.

The third publication contains general information about several food products, together with a report by T. Sanderson containing the results of a study by grades of the different types of wheat grown in North Dakota for the 5 crops, 1908 to 1912, inclusive, from which it is concluded that "wheat can not be successfully graded from general appearances without a milling and baking knowledge of what the peculiar appearances indicate."

The fourth publication contains a discussion of condensed chicken soup noted on page 659 and an analysis of a commercial egg preservative in powdered form to be added to water in the same way as water glass. It was found to consist of lime (30 per cent) and sodium silicate (70 per cent), with traces of iron and alumina. "It is not necessarily true that [this product] under its fanciful name . . . would prove any more valuable as an egg preservative than the water glass itself."

New ways and old—a manual of cookery especially adapted to the gas range, ELSIE G. CARING ([*Rochester, N. Y.*], 1913, pp. 19).—A number of recipes are given, together with tables which indicate the amount of heat to be used and the time required for cooking the different articles.

Camp cookery, AVA B. MILAM and RUTH McN. SMITH (*Oreg. Agr. Col. Bul., Ext. Ser. 3, No. 1, 1913, pp. 47, fig. 1*).—This bulletin has been prepared for the special use of forest rangers, campers, and sportsmen, and offers suggestions as to the kinds of foods needed, ways of preparing them, and equipment needed.

Hygienic interpretation of recent changes in field rations and their preparation, H. C. FISHER (*War Dept. [U. S.], Off. Surg. Gen. Bul. 2, 1913, pp. 124-129*).—Various army rations and their method of preparation in the field are described.

Health through diet, K. G. HAIG (*London, 1913, pp. X+227*).—This book outlines and discusses the value which the author believes can be derived from a uric-acid-free diet.

Numerous personal experiences are cited and several questions concerning diet are taken up. Lists of the foods forbidden and allowed on this basis, with a discussion of their value in the diet, are given. The value of such a diet for children and in cases of pregnancy and its slight modifications in disease are also considered.

The author points out a number of errors which should be avoided in changing from one diet to another, and gives two methods of changing from a high protein to a low protein diet.

The appendix contains a discussion of the fundamental principles of foods and several dietaries.

The effect of completely hydrolyzed food on the digestive tract, O. COHN-HEIM (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 84 (1913), No. 7, pp. 419-424).—Experimental data are presented showing the effect produced upon the digestive secretion by two commercial food products which it is claimed are prepared by the reduction of protein food to the elementary "building stones" or amino acids without any loss of the food material.

When fed to dogs having duodenal and gastric fistulas, almost as much secretion was observed as in the case of the ordinary unchanged food, and the food passed the stomach no quicker. Solutions of these preparations injected into the small intestines were completely absorbed and produced no secretion.

The ferments of the pancreas.—I, The generation of trypsin from trypsinogen by enterokinase, J. MELLANBY and V. J. WOOLLEY (*Jour. Physiol.*, 45 (1912), No. 5, pp. 370-388, figs. 2).—Experimental data are given, with the following conclusions:

"The length of time taken by the activation process is a function of the amount of enterokinase added. After the addition of a definite amount of enterokinase trypsin is produced at a constantly increasing rate as the reaction proceeds. The velocity of the change is accelerated by a rise in temperature. The reaction proceeds most quickly in neutral solution, is delayed by alkali, and stopped by acid. There is no evidence that trypsin can activate trypsinogen or that trypsin can act as a coenzyme to enterokinase. Proteins apparently delay the activation process, but this observed delay is probably due to the absorption of the first formed trypsin by the protein, the amount of delay varying with different proteins."

These results are explained by the authors on the ground that enterokinase is a proteolytic ferment, acting best in a neutral solution, which liberates the trypsin from the trypsinogen.

The ferments of the pancreas.—II, The action of calcium salts in the generation of trypsin from trypsinogen, J. MELLANBY and V. J. WOOLLEY (*Jour. Physiol.*, 46 (1913), No. 2, pp. 159-172).—Experimental data are presented which indicate that calcium salts are not essential for the action of enterokinase or trypsinogen, since this action can take place in calcium-free solutions and barium and strontium salts can activate pancreatic juice as effectively as those of calcium.

The activation of pancreatic juice by calcium salts is explained by the authors on the ground that pancreatic juice always contains enterokinase but in some instances it is present in so small an amount that its action is inhibited by the alkali of the pancreatic juice. The addition of calcium salts to the juice removes the alkali and thus accelerates the rate of trypsin production.

Comparative study of the tryptic digestion of raw milk and of milk dried at high temperatures, E. C. AVIRAGNET, H. DORLENCOURT, and M. BLOCH (*Compt. Rend. Soc. Biol. [Paris]*, 74 (1913), No. 15, pp. 885-887, fig. 1).—According to the results obtained by other workers, which are referred to in this article, the higher the temperature at which the milk is dried the greater is the digestibility of the product obtained, provided the heat is not raised higher than 130-140° C. and is applied for only a short time. Prolonged heating tends to increase the digestibility.

In the experiments described samples of raw milk and of solutions of dried milk containing equal amounts of nitrogen were treated with the same quantity

of a trypsin solution, under like conditions, and the rate of digestibility of the two samples determined. The results obtained showed that the digestion of the dried milk, although no more rapid than that of the raw milk, was in the end more complete.

The comparative effect of light and dark meat upon the excretion of uric acid and other nitrogenous constituents of urine, A. VON SIEWERT and E. VON ZEBROWSKI (*Ztschr. Klin. Med.*, 75 (1912), No. 3-4, pp. 331-358, figs. 7; *abs. in Zentbl. Expt. Med.*, 2 (1912), No. 16, p. 724).—With 5 men as subjects, chicken breast as a representative white meat and fillet of beef as a representative dark meat were added to a uniform purin-free diet.

The same increase in the uric acid curve resulted whichever sort of meat was eaten. The total amount of uric acid excreted was also the same with the two kinds of meat. In the case of white meat this excretion was completed in 2 or 3 days and in the case of dark meat in from 4 to 7 days. This variation in time, which suggests a marked difference in judging the two sorts of meat, may be due to a slower cleavage of the purins of dark meat or to a slower passage through the kidneys of the nitrogenous materials which it furnishes.

The results are discussed with reference to the treatment of gout.

Contribution to the physiology of carbohydrate in the body—changes produced in the cells of the parenchymous organs by carbohydrates introduced into the body in excess, D. P. GRINIEW (*Arch. Sci. Biol. [St. Petersburg]*, 17 (1912), No. 3, pp. 240-243).—The results of experiments with small laboratory animals are reported and discussed in which it was observed that the introduction of excessive amounts of carbohydrate into the body produced distinct and characteristic histological lesions. The cellular protoplasm as well as the nuclei of the cells was affected.

The authors conclude that carbohydrates not only contribute to the heat production of the organism, but also take part in the building up of the tissues. It is probable that the carbohydrates are combined in the nuclei with some lipoid substance as is the case in the liver. Glucose circulating in the blood probably stimulates the functions of the suprarenal capsules.

The effect of sugars on digestion, E. THOMSEN (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 84 (1913), No. 7, pp. 425-436, pl. 1).—A number of experiments are described, showing the effect produced upon the secretion of digestive juices by the administration of sugar with the food in the case of animals having duodenal and gastric fistulas.

The results obtained show cane sugar to have no direct effect upon gastric secretion. It also does not influence pancreatic or biliary secretion. It prolongs gastric digestion by its action through the small intestine in lengthening the intervals between the emptying of the stomach, during which time the bile and pancreatic juices are being secreted. Cane sugar is almost completely absorbed in great quantities in the small intestine, and by preventing the absorption of other products, prolongs the action of hydrochloric acid.

Measure of the glycolytic power by the study of nitrogen elimination, H. MAGNE (*Compt. Rend. Soc. Biol. [Paris]*, 74 (1913), No. 16, pp. 947, 948).—The ingestion of 20 gm. of glucose by a fasting man produced a marked decrease in the protein catabolism, as was indicated by the variations in the amount of urinary nitrogen. The same effect was produced by the subcutaneous inoculation of fasting animals with small amounts of glucose.

It is proposed to determine the limits of sensibility of the method in its application to the study of glycolytic insufficiency.

The value of seasoning in the diet, A. GIGON (*Klin. Ther. Wehnschr.*, 44 (1912), No. 44, pp. 1281-1285; *abs. in Zentbl. Physiol.*, 26 (1912), No. 25, p.

1293).—According to the author's summary, spices and condiments exercise a psychic effect by increasing the pleasure of taking food.

Certain of them, for instance pepper, salt, and bitter substances exercise an effect upon the secretion of saliva and the gastric and intestinal juices. The principal effect of onions, mustard, garlic, and related plants is found in the influence they exercise on the intestinal flora; salt, pepper, and chocolate are regarded as having an effect on intermediary metabolism, while coffee, tea, cocoa, alcohol, and vanilla exercise an effect upon the nervous system after resorption.

Lime in the dietary (*Jour. Amer. Med. Assoc.*, 61 (1913), No. 3, p. 200).—This article deals briefly with the losses of inorganic elements incurred by the body in processes of metabolism, together with the variation in the lime requirements of the organism under different conditions, such as periods of growth, starvation, lactation, etc. The need of much research work upon this subject is indicated.

The importance of lecithin in the metabolism of adults, W. CRONHEIM (*Ztschr. Phys. u. Diätet. Ther.*, 16 (1912), No. 5, pp. 262–272; *abs. in Zentbl. Expt. Med.*, 2 (1912), No. 16, p. 721).—The effect of diets poor and rich in lecithin was studied.

During the lecithin period nitrogen was better assimilated. The phosphorus balance was in one case much increased and in the other only slightly so, while the digestibility of fat was not affected. The author believes that taking lecithin in not too great quantities is favorable to adults and that it helps to make good any loss of nitrogen, since it induces better utilization of this nutrient.

The necessity of certain lipins in the diet during growth, E. V. McCOLLUM and MARGUERITE DAVIS (*Jour. Biol. Chem.*, 15 (1913), No. 1, pp. 167–175, figs. 5).—A normal rate of growth was maintained for periods of from 70 to 120 days in the case of young rats which were fed upon diets consisting of pure casein, pure carbohydrates, and salt mixtures made up of pure reagents. Although this diet was unable to produce growth for a longer period, it maintained the animals in an apparently well nourished condition for several weeks. Growth at about the normal rate was resumed when the ether extract of butter or of egg was added to the ration. This was not the case, however, when lard or olive oil was added without the ether extract.

From the results of these experiments, which are to be continued, the authors conclude that “these extracts contain some organic complex without which the animals can not make further increase in body weight, but may maintain themselves in a fairly good nutritive state for a prolonged period.”

Studies on beri-beri.—VII, Chemistry of the vitamin-fraction from yeast and rice polishings, C. FUNK (*Jour. Physiol.*, 46 (1913), No. 3, pp. 173–179).—From the experimental data reported, the author draws the following conclusions:

“The vitamin-fraction from yeast has been separated into three substances: A substance of the formula $C_{14}H_{19}O_6N_2$, a substance of the formula $C_{25}H_{25}O_6N_4$, and what appears to be nicotinic acid (m-pyridin-carboxylic acid). The first substance mixed with nicotinic acid seems to be necessary for curing pigeons.

“The vitamin-fraction from rice polishings has up to the present been separated in two substances: One of the formula $C_{25}H_{25}O_6N_4$ and nicotinic acid. The results concerning their curative power will be published after the chemical investigation of all the fractions has been completed.” See also a previous note (*E. S. R.*, 29, p. 463).

Fasting studies.—XI, A note on the composition of muscle from fasting dogs, H. C. BIDDLE and P. E. HOWE (*Biochem. Bul.*, 2 (1913), No. 7, pp. 386–

389).—Determinations are reported of the moisture, nitrogen, fat, and creatin content of muscle from fasting dogs.

A new method of recording the respiration of man, P. TULLIO (*Arch. Ital. Biol.*, 55 (1911), No. 2, pp. 306-312, figs. 6).—The apparatus described records the respiratory movements of the thorax and abdomen on a kymograph, by means of a marker operated by a system of pulleys and cords connected with light weights which rest upon the body of the subject who is in a reclining position.

ANIMAL PRODUCTION.

[Ancestry and heredity], E. LEHMANN (*Experimentelle Abstammungs und Vererbungslehre. Leipzig, 1913, pp. VIII+104, figs. 26*).—This is a scientific treatise dealing with the principles of evolution and the Mendelian theories of inheritance. The problems of variation, origin of species, hybrids, mutations, and other related subjects are considered.

The Mendelian law of inheritance and its application to domestic animals, B. CALDERÓN (*Prog. Agr. y Pecuário, 19 (1913), Nos. 830, pp. 453-455; 831, pp. 469, 470*).—In this article the author reviews the theories of Darwin and the law propounded by Mendel with regard to the inheritance of characters, and explains the occurrence of dominant and recessive characters in hybrids with special reference to our domestic animals.

The drawing up and printing of pedigrees, WILSDORF (*Ztschr. Gestütk.*, 8 (1913), No. 3, pp. 63-67; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 5, pp. 777-780).—The author suggests the need of a uniform system of pedigree tables, and presents a form with explanations as to its use.

Terminology on the structure of animals and plants, W. ROUX ET AL. (*Terminologie der Entwicklungsmechanik der Tiere und Pflanzen. Leipzig, 1912, pp. XII+465*).—A German vocabulary of the scientific terms applied to the structure and conformation of animals.

Individuality of the chromosome, C. OHLY (*Deut. Landw. Tierzucht*, 17 (1913), Nos. 25, pp. 293-295; 26, pp. 305-307).—This is a scientific treatise on the nature of the chromosome, and of the various theories regarding its importance in body development.

The passage of products of the digestion of albuminoids from the mother to the fetus, G. BUGLIA (*Biochem. Ztschr.*, 48 (1913), No. 5, pp. 362-372; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 5, p. 775).—In experiments with bitches far advanced in pregnancy "it was clearly proved that a portion of the nonalbuminous nitrogen injected into the mother's blood had found its way into that of the fetus."

The pepsin and chymosin question, A. RAKOCZY (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 84 (1913), No. 5, pp. 329-353; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 6, p. 922).—It was found that young ruminants, foals, and pigs secrete, in addition to pepsin, an independent ferment (chymosin) which coagulates milk.

[Nutrition experiments], W. VÖLTZ (*Jahrb. Ver. Spiritus Fabrik, Deut.*, 13 (1913), pp. 153-179).—This chapter comprises a series of short discussions on feeding and nutrition problems, including the physiological value of alcohols, the nutritive value of dried and fresh brewers' grains, of potato and corn refuse, and potato tops, and the use of various fermentation products and by-products in animal feeding.

Concentrated feeding stuffs.—Feeding stuffs law of 1912 and registration, C. S. CATHCART ET AL. (*New Jersey Stas. Bul.* 256, pp. 3-102).—A report of analyses of the following commercial feeding stuffs: Gluten feed, cotton-seed

meal, linseed meal, hominy meal and feed, brewers' and distillers' dried grains, buckwheat middlings, malt sprouts, cotton-seed meal and hulls, molasses feed, wheat bran and middlings, alfalfa meal, ground rye, rye bran and middlings, corn meal, dried beet pulp, buckwheat hulls, oat hulls, cob meal, corn bran, corn-and-cob meal, ground oats, ground flax screenings, ground puffed wheat, ground puffed rice, meat meal, beef scrap, and proprietary mixed feeds. The text of the feeding stuffs law adopted in March, 1912, is included, likewise registrations for 1913.

The Kansas feeding-stuffs law revision of 1913 (*Kansas Sta. Circ. 30, pp. 6+7*).—This circular gives the text of this law, together with the regulations adopted, definitions of commercial feeds, and explanations of the feed control requirements.

Western grazing grounds and forest ranges, W. C. BARNES (*Chicago, 1913, pp. 390, pls. 6, figs. 116*).—This is a very comprehensive volume dealing with western range and forest conditions, in which the author treats of the management of cattle and sheep on the range, poisonous plants, diseases of cattle and sheep, and related topics.

Report of the animal husbandman, E. G. RITZMAN (*Porto Rico Sta. Rpt. 1912, pp. 39-42*).—This reports favorable results from the crossing of an American saddle-bred stallion and a number of standard-bred trotters upon native mares. The crossing of the zebu upon the Shorthorn and Hereford breeds of cattle has resulted in heavier progeny, one lot of 62 calves weighing between 600 and 700 lbs. each when one year old, as compared with about 400 lbs. in those from native bulls. The use of Shorthorn and Guernsey bulls on native foundation is improving the dairy stock. Milk from native cows is reported as being as rich in milk fat as the milk from average dairies in the North. It is stated that poultry can be grown as well in Porto Rico as in the North and that the losses need not be greater if the fowls are properly handled.

The administrative measures taken in Holland in favor of cattle breeding, F. B. LÖHNIS (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 5, pp. 667-673*).—In this paper are outlined in brief the methods used in Holland for the encouragement of improved cattle breeding. These include the 2 standard Holland herdbooks, bounties granted by the central government to the provincial commissions, the work of breeding and dairy experts, government professors of agriculture, stable competitions, and shows.

Progress of cattle breeding in Denmark and Sweden, DADE (*Arch. Deut. Landw. Rats, 37 (1913), pp. V+312*).—This is a statistical report of the export and import trade in dairy and meat products in these countries and a résumé of the progress in improved cattle breeding.

Cattle breeding in Dutch East Africa, G. LICHTENHELD (*Tropenpflanzer, 17 (1913), No. 8, pp. 405-430, figs. 10*).—A treatise on the races of cattle in Dutch East Africa, their breed characteristics, body measurements, distribution, care and management, and utility value.

The past year in the Australian meat trade (*Butchers' Advocate, 55 (1913), No. 20, p. 12*).—A statistical review of the Australian meat trade in which is noted an increasing development of a trade in frozen meat with the United States.

Report of the animal husbandman, C. A. WILLSON (*Tennessee Sta. Rpt. 1911, pp. 175-177*).—As in the previous year, it was found that steers fed in the open made as good gains as those fed under sheds. In comparison with a number of other rations the most economical ration seemed to be silage and cotton-seed meal when the meal is fed in the proportions of 4 lbs. per head per day

the first 30 days, 5 lbs. the second 30 days, and 6 lbs. the third 30 days. It appeared that when 10 lbs. of dry feed is added to the silage ration it made but little difference what roughage is added, provided it be palatable.

In experiments to determine the effect of breed on gains, it was found that in 90 days "steers that were the result of 1 or more crosses of a beef breed made 39.2 lbs. more gain than steers in which dairy blood predominated. Beef-bred steers made 41 lbs. more gain than scrub steers. Not only did the better-bred steers make more gains, but the gains were put on in the more valuable beef cuts and thus made them sell at a wider margin and greater profit. . . . Steers of very good feeder type made 18.1 lbs. more gain than the next grade lower and 33.2 lbs. more than steers medium to poor in type."

Report of the animal husbandman, C. A. WILLSON (*Tennessee Sta. Rpt. 1912, pp. 57-59*).—Continuing the above work, "the results from the experiments thus far indicate that low to medium cotton-seed meal rations are equally as efficient for a 90-day feeding period as large amounts of cotton-seed meal. The same rate of gain was obtained when cotton-seed meal was fed at the rate of from 4 to 6 lbs. per day as when it was fed at the rate of 7 to 9 lbs. per day. . . . The experiments for the past year have shown that larger gains are made through the use of silage with cotton-seed meal than can be made through the exclusive use of cotton-seed hulls for the roughage part of the ration."

In the experiment on the influence of type and breeding upon rate of gain, "the results checked with former years in that it was found that steers of best feeder type and with the greatest percentage of beef breeding made the most gains. . . . Steers that showed one or more crosses of some beef breed made 15 per cent greater gains than steers that did not show some blood of any of the beef breeds. . . . Steers that were of very good type made 23.6 per cent greater gains than steers of poor feeder type."

A beef producing capacity per acre was obtained from several crops as follows: Of soy beans and barley 387 lbs., cowpeas and barley 364, corn and barley 332, soy bean hay and barley 365, soy beans and wheat 654, soy beans and oats 574, and alfalfa 300.

Corn silage for fattening 2-year-old steers, H. O. ALLISON (*Missouri Sta. Bul. 112, pp. 259-275, figs. 5*).—Experiments were conducted with 24 2-year-old steers to determine the relative feeding value of corn silage, clover hay, and shock corn, and to study the value of a nitrogenous concentrate when fed in a ration where corn silage is used. Five lots of grade Shorthorn steers were fed for a period of 130 days, with the following results:

Weights, gains, and profits on steers and pigs with various rations.

Lots.	Ration fed.	Average daily gain.	Gain in weight of pigs per steer.	Cost per pound of gain.	Profit per steer.
		<i>Pounds.</i>	<i>Pounds.</i>	<i>Cents.</i>	
1	Shelled corn, linseed oil meal, and clover hay.....	3.045	71.86	6.46	\$2.82
2	Shelled corn, linseed oil meal, and corn silage.....	2.009	74.00	6.03	4.79
3	Shelled corn, corn silage and clover hay.....	2.039	37.80	6.27	2.09
4	Shelled corn, linseed oil meal, corn silage and clover hay..	3.155	60.87	5.99	7.41
5	Shelled corn, linseed oil meal, shock corn and clover hay..	3.159	86.50	6.28	4.08

The rates of gain in live weight were quite uniform, except that the steers in lot 2 fell off materially during the last 40 days, losing appetite for the silage and losing their fill. This was not the case in other lots which received clover hay in addition to corn silage. Lot 4, fed on silage, carried the best finish and was valued at a premium.

It is concluded that "a ton of silage as used in this experiment was approximately equal to one-half ton of clover hay. Estimated on the basis of net profit per steer, a ton of dry matter in the form of corn silage yielded 50.3 per cent greater value than a ton of dry matter in the form of stock corn. The addition of clover hay to a ration in which silage was used was decidedly profitable in this test. It appears from the data given that fattening cattle which receive corn silage as the only roughage do not continue to do well for longer than 90 days.

"One of the most conspicuous features of this test was the notable superiority of the ration in which a nitrogenous concentrate was used. If the most extensive use is to be made of corn silage in fattening cattle it is desirable to feed some high protein concentrate in the ration. It is evident from the data given that it takes less grain in the form of shelled corn to fatten 2-year-old steers when corn silage composes a part of the ration."

Calf-feeding experiments with separated milk and oils, J. HENDRICK (*Trans. Highland and Agr. Soc. Scot., 5. ser., 25 (1913), pp. 259-282*).—Three series of experiments of 5 weeks each were conducted to demonstrate the value and economy of feeding calves on separated milk and substitutes, and to compare the relative values as substitutes of cod liver oil and cotton-seed oil with whole milk feeding. A summary of results is shown in the following table:

Results of calf-feeding experiments with separated milk and oils.

Experiment.	Kind of milk ration.	Number of calves.	Increase in weight.	Total cost.	Average cost per pound of increased weight.
			Pounds.	£ s. d.	d.
1	Whole milk.....	14	207	4 2 3	4.77
2	Cod liver oil.....	15	184	1 8 0	1.83
3	Cotton-seed oil.....	15	177	1 7 3	1.85

Although the larger gains were made on the whole milk, in the case of the substitutes used the difference was not very serious, and was also small between the two substitutes. It is concluded that "cotton-seed oil may be fed to calves as a substitute for the fat of milk in quantities up to 3 oz. per calf per day, and that so far as these experiments show, it will give as good or nearly as good a result as cod liver oil and at a slightly lower cost." It is further stated that "placing a fair valuation upon whole and separated milk, calves can be fed on separated milk, oil, and meal gruel at a very much less cost per head and at a very much less cost per pound of increase than upon whole milk."

Following these feeding tests the calves were fed alike and sold as 2-year olds with a resulting average increase from weaning until sent to the butcher of 911 lbs. for the whole milk lot, 944 lbs. for the lot fed separated milk and cod liver oil, and 898 lbs. for that on separated milk and cotton-seed oil.

The experiments in general indicate that separated milk and substitutes may be fed to calves with safety and profit.

The employment of whole milk and of corrected skim milk in the rearing of calves and pigs, O. WELLMANN (*Kisérlet. Közlem., 16 (1913), No. 2, pp. 118-258; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 7, pp. 1062, 1063*).—These experiments demonstrated the possibility of the economical use of skim milk for calf and pig feeding when corrected with either wheat and rye meal, with flour starch sweetened with

"diafarine," or homogenized with a fat substitute of beef suet preparation. The corrected milk when fed to the calf produced scouring and catarrh, but with pigs it increased the appetite and aided growth, average daily gains of from 2.2 to 3.1 lbs. per 100 lbs. live weight being realized. The homogenized milk was readily taken by the pigs, but in some cases produced scours, this being corrected by the addition of a small amount of citric acid solution.

Skim milk corrected with sweetened flour proved to be the least expensive of the several milks fed, this and homogenized milk being from one-half to two-thirds as expensive as whole milk. The younger the pigs and the more nutritive the milk, the greater was the proportion of protein digested.

Roughage for fattening lambs, J. W. WILSON (*South Dakota Sta. Bul. 143, pp. 187-199*).—From experiments testing the relative value of several roughages as feeds for fattening lambs, it is concluded that corn silage as a sole ration for lambs is not the best of feeds; that white sweet clover is an excellent roughage when fed with a grain ration; that pea hay is a good roughage; and that alfalfa, both of the blue flowered and the introduced Siberian type, is very palatable and a highly nutritious feed for lambs. Shredded corn fodder fed with grain was less satisfactory. The results obtained are summarized in the following table:

Results in lamb-fattening experiments on various roughages.

Kinds of feed.	Number lambs in lot.	Grain consumed.	Hay consumed.	Total gain in weight.	Grain fed for a pound of gain.	Hay fed for a pound of gain.	Average daily gain in weight per head.
		<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
Siberian alfalfa hay and grain.....	5	639	476	164	3.89	2.90	0.48
Common alfalfa and grain.....	5	639	574	190	3.36	3.02	.56
White sweet clover and grain.....	10	1,280	924	289	4.42	3.19	.43
Canadian field pea hay, grain.....	10	1,280	748	237	5.40	3.15	.35
Shredded corn fodder and grain.....	10	1,240	865	213	5.65	3.96	.32
Prairie hay and grain.....	10	1,239	572	243	5.09	2.35	.36
Corn silage.....	10	2,521	.....	-9	.....	.....	.....

Sheep and wool for the farmers, J. W. MATHEWS (*Agr. Gaz. N. S. Wales, 24 (1913), No. 3, pp. 185-200*).—With an object of ascertaining the most valuable dual purpose wool, mutton, and early maturing type, and of determining the most valuable combination for export as early lambs, experiments were carried on with various crossbred lambs.

In these tests a Dorset Horn-Lincoln-Merino cross produced the greatest average light weight, i. e., from 74 to 80 lbs.; the Dorset Horn-Border Leicester-Merino next, 76 to 79 lbs.; Shropshire-Lincoln-Merino, 67 to 77 lbs.; and the Southdown-Lincoln-Merino, 66 to 72 lbs. The second crosses proved the most valuable for export purposes. "The Dorset Horn-Lincoln-Merino and Dorset Horn-Border Leicester-Merino combinations gave the best returns, both for gross and net values. The Southdown and Shropshire crosses realized equal amounts per pound, but the consistently heavier weights of the Dorset Horn crosses enabled them to give the best total returns. The main feature of the whole shipment was the unsuitability of first crosses for export, unless the grower is prepared to market them as third quality, and the value of the second cross is further emphasized. There is very little difference between these, but the earlier maturing qualities of the Dorset Horn places it at a great advantage."

Sheep breeding in Hungary, B. Kovácsy (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 5, pp. 680-688*).—This is a statistical review of the sheep industry in Hungary, with an account of the distribution and importance of the different breeds indigenous to that country. Methods of sheep management are discussed and the financial problem is considered.

Forage crop rotations for pork production, F. B. MUMFORD and L. A. WEAVER (*Missouri Sta. Bul. 110, pp. 181-208, figs. 6*).—This bulletin reports swine-feeding experiments covering a period of 5 years (*E. S. R., 25, p. 274*) and conducted to determine the relative value of different forage crops and forage crop rotations for pork production. Leguminous forages were supplemented by corn, and other forages by corn and linseed meal 6:1. The results showing the average gains, acre production, valuation per acre, etc., are summarized in the following table, pork being estimated at 6 cts. per pound:

Results in forage crop experiments and pork production.

Forage crop.	Period of experiments.	Average time pastured.	Average number of hogs per acre.	Total gain in weight per acre.	Gain accredited to forage.	Grain fed per acre.	Grain fed per pound of gain.	Gain per bushel of corn fed.	Value of forage per acre.	Value of pork produced per bushel of corn fed.
	Years.	Days.		Pounds.	Pounds.	Pounds.	Pounds.	Pounds.		
Blue grass.....	5	165.00	12.00	1,645.0	324.6	7,392.0	4.50	12.4	\$19.47	\$0.74
Clover.....	2	133.00	11.00	1,211.0	567.7	3,601.0	2.95	18.9	34.05	1.13
Alfalfa.....	1	163.00	10.30	1,310.0	591.8	4,022.0	3.07	18.2	35.51	1.09
Rape.....	1	98.00	19.80	770.0	392.8	2,112.0	2.74	20.4	23.57	1.22
Rape and oats.....	2	126.00	9.30	1,002.0	354.1	3,629.0	3.60	15.5	21.25	.93
Rape, oats, and clover.....	3	90.00	10.67	766.0	414.6	1,969.0	2.47	22.6	24.87	1.36
Sorghum.....	2	86.50	15.00	1,140.6	275.0	4,848.0	4.00	14.0	16.50	.84
Cowpea.....	5	32.80	12.70	331.9	212.7	1,004.5	3.58	15.6	9.16	.94
Soy bean.....	4	31.00	14.40	262.0	117.6	898.0	3.00	18.6	7.05	1.12
Rye.....	5	49.60	12.00	348.1	211.7	764.8	1.56	28.5	12.70	1.71
Corn and cowpea (hogged off).....	4	34.75	14.00	324.5	324.5				19.48	.....
Corn (hogged off).....	4	36.4	14.00	379.8					21.79	.....
Dry lot feeding.....							5.11	11.0		.66

The following table gives the average return per acre for several rotations during a period of 4 years on 10 different fields:

Average returns in pork production with various cropping systems.

Crops grown during 4 years.				Average returns per acre.
First year.	Second year.	Third year.	Fourth year.	
Blue grass.....	Blue grass.....	Blue grass.....	Blue grass.....	\$22.53
Rape, oats, and clover.....	Clover.....	Corn.....	Rape, oats, and clover.....	22.42
Corn and cowpeas.....	Corn and cowpeas.....	Corn and cowpeas.....	Corn and cowpeas.....	19.48
Corn.....	Rye.....	Soy beans.....	Corn.....	18.54
Do.....	Soy beans.....	Corn.....	Soy beans.....	16.46
Sorghum.....	Rape, oats, and clover.....	Cowpeas.....	Sorghum.....	16.35
Cowpeas.....	Corn.....	do.....	Corn.....	15.93
Rye.....	do.....	Rye.....	Soy beans.....	11.70
Soy beans.....	do.....	Soy beans.....	Rye.....	9.44
Rye.....	Cowpeas.....	Rape and oats.....	Cowpeas.....	9.10

The general conclusions of these experiments are as follows: "Clover proved to be the most profitable single forage crop for pork production. Next to clover, rape and oats produced the largest number of pounds of pork per acre. Corn has been successfully and profitably utilized by permitting the hogs to harvest the crop. In general it may be said that under existing conditions the cost of producing pork may be greatly reduced by making a larger use of forage crops. A good system of forage crop rotations for Missouri is a 3-year rotation of rape, clover, and corn in conjunction with permanent blue grass pasture."

Report on pig feeding experiments, B. N. WALE (*Seale-Hayne Agr. Col. [Pub. 1], 1913, pp. 16*).—Results of experiments carried out during the last 3 years to compare the value of various feeds for pork and bacon production are reported.

A comparison of the feeding value of English and Russian barley gave the latter the preference both as to yields and financial returns. In an experiment where soy-bean cake replaced barley, "it was found that a much greater profit was realized where no soy-bean cake was fed, and that soy-bean cake in small quantities did not form a profitable feed for bacon production."

In an experiment testing the value of fish meal for pig feeding, 1 lot of pigs fed approximately 2 lbs. of fish meal and 7 lbs. of gram and maize for 4 months, made about 21 lbs. per pig greater gain than another lot fed on gram and maize alone. In another case a lot of pigs receiving about 1 lb. of fish meal and 7 lbs. maize during a 4 months' feeding period made 34 lbs. per pig greater gain than a lot fed on maize alone. In both instances financial returns favored the pigs fed on fish meal.

Swine-feeding experiments with hominy feed in comparison with barley, Institute at Proskau, 1912, KLEIN (*Mitt. Ver. Deut. Schweinezüchter, 20 (1913), No. 7, pp. 143-145*).—In experiments with 6-weeks-old pigs for a period of 12 weeks lot 1, receiving per head an average daily ration of 2.5 kg. milk and 0.6 kg. barley made a total gain of 205 kg. at a cost of 0.53 mark (5.73 cts. per pound) per kg. Lot 2, receiving 2.5 kg. milk, 0.24 kg. barley and 0.36 kg. hominy, made a total gain of 212.25 kg., costing 0.49 mark per kilogram. Analyses of these feeds showed the hominy to be somewhat higher in crude protein and ash than the barley.

Fattening of pigs with the automatic feeder, DE LA BARRE (*Abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 6, pp. 932, 933*).—Four 6-weeks-old pigs were fed crushed barley, wheat meal, and fish meal freed from fat 2:1:0.2, in addition to an allowance of separated milk for the first four weeks and of mangels and green feed thereafter, and when 26 weeks old had made a total gain of 754.6 lbs., costing £1 8s. 5d. (\$6.91) per 100 lbs. gain.

Action of iron-containing blood meals on iron assimilation in animals, J. GRÖH (*Biochem. Ztschr., 53 (1913), No. 3, pp. 256-258*).—Experiments with swine indicated that the feeding of iron-containing blood meal did not materially increase the iron content of the body over that of animals not so fed.

The regular irregularities of the pulse of the horse, L. STEGEMANN (*Die Reguläre Irregularität des Pulses beim Pferde. Inaug. Diss., Tierärztl. Hochsch. Hannover, 1912; abs. in Deut. Tierärztl. Wehnschr., 21 (1913), No. 26, p. 421*).—The author calls attention to the periodic irregularities of the pulse of the horse and explains the causes for this apparent phenomenon.

On the process of stomach digestion of the normally fed and watered horse, A. SCHEUNERT and A. SCHATKE (*Ztschr. Tiermed., 17 (1913), Nos. 5, pp. 177-264, figs. 2; 6, pp. 225-245, figs. 18; 7, pp. 273-302*).—This is a technical

description of the digestion of the horse in which the authors summarize the results of their investigations along this line. They discuss such phases as the period of digestion in the normally fed horse, the processes of starch and protein digestion, the lapse of time intervening between feeding periods and the digestive processes in operation at this time, and the effect of drinking water upon the digestive processes and upon the composition of the food within the stomach. The course of the food and water is outlined and the complete mechanical process of digestion explained.

The profitable breeding of horses, J. L. SHANNON (*West Indian Bul.*, 13 (1913), No. 3, pp. 287-291, fig. 1).—The author comments on the origin of the American carriage horse from saddle horse and standard bred stock and on government encouragement in the extension of this breed. He argues for the introduction of this type of horse into the West Indies and of improved horse-breeding methods looking toward the American carriage horse as the desirable type.

[Report on poultry], W. A. GRAHAM (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 38 (1912), pp. 106-109).—Experimental feeding of Buff Orpington, Rhode Island Red, and White Leghorn hens on different rations, viz, buttermilk, 10 per cent dry mash beef scrap, beef scrap in the hopper, no animal feed, and green cut bone indicated that "with all 3 breeds buttermilk produced the most and the cheapest eggs. Where beef scrap was fed in a hopper or where the birds could eat all they desired the Leghorns and Rhode Island Reds did much better than the Orpingtons. No animal feed in all instances gave the best eggs for hatching and the lowest egg yield." Leghorns developed a feather-eating habit when fed on a no meat feed ration.

Ten years' egg-laying tests, A. A. DUNNICLIFF, Jr. (*Dept. Agr. N. S. Wales, Farmers' Bul.* 66, pp. 96, pls. 9, figs. 19).—This is a complete summary of 10 years' egg-laying tests as to the laying capacity and breed improvement of a total of 4,008 hens, including all breeds.

As regards the relation between weather conditions and egg production it is concluded "that there is nothing to connect variations in egg production with abnormal heat or cold. The average output of eggs has right through been consistent with the seasonal changes from month to month. Excessive rainfall, however, either in cold or hot weather, has almost invariably resulted in decreased laying for the time being; and it is plain that wet weather is the greatest factor in fluctuations in production."

A complete summary is given of the average laying capacity per hen of each breed tested, the average weight per dozen eggs, the average value and profit, and the relative ranks of the breeds. The breeds wholly or partially of Asiatic origin were found to be superior to the Mediterranean breeds in autumn-winter laying capacity.

The general result of the dry-mash feeding test was altogether in favor of the morning wet-mash system of feeding. In meat versus non-meat feeding experiments it is concluded that the addition of the amount of meat given had practically no influence on the number of eggs produced. On test comparing the egg-laying capacity of the various breeds of ducks, the Indian Runner breed proved superior.

Egg-laying competitions, 1912-13, D. F. LAURIE (*Dept. Agr. So. Aust., Egg-Laying Competitions 1912-13*, pp. 35).—A report of egg-laying competitions for this and previous years with results corroborating competitions previously reported (*E. S. R.*, 29, p. 275).

Fur farming for profit, H. B. LAYMON (*Spencer, Ind.*, 1913, pp. 78, figs. 13).—A booklet dealing with the care and management of the skunk for fur purposes, with information on skinning, shipping, etc.

Breeding mink for their fur, G. F. NORTON (*New York, 1913, pp. 22, pl. 1, figs. 6*).—This booklet contains directions for the breeding, feeding, care, and management of mink for fur purposes.

Canadian live-fox shipments, G. C. WOODWARD and E. J. WHITE (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 200, p. 1158*).—A report of the progress of fox breeding in eastern Canada and the United States, and of its growing importance in these sections.

DAIRY FARMING—DAIRYING.

Report of the dairy and cold storage commissioner, J. A. RUDDICK ET AL. (*Rpt. Dairy and Cold Storage Comr. Canada, 1911, pp. 142, pls. 14*).—This report includes items on the following subjects: The outlook for dairying in Canada; progress report on experiments in the care of hand separator cream; casein manufacture; cow-testing associations in Canada; reasons for cow testing; export trade of butter and cheese; and data on the average temperature of creamery butter at Canadian shipping points.

Report of the dairy experiment station of the Province of Posen for 1912-13, H. TIEMANN, II. HERRAMHOFF and H. KIRSCH (*Ber. Vers. Stat. u. Lehranst. Molkw. Wreschen, 1912-13, pp. 16*).—The principal feature of this report is a comparison of the specific weights of the milk and serum and the fat content of the milk for the different months of the year. In these tests the specific weight was lowest in June and highest in January. The fat content was lowest in June and highest in November.

Milk records, E. MATHEWS (*Jour. Roy. Agr. Soc. England, 73 (1912), pp. 9-25*).—This article is an account of government milk testing systems in operation in England, Friesland, Denmark, Germany, Ayrshire, Canada, Australia, and Ireland and a discussion of the rules and regulations that should accompany such systems.

Can a dairy cow be judged by a 2-year-old record, C. H. ECKLES (*Hoard's Dairyman, 46 (1913), No. 1, p. 6*).—The author made a study of the milk fat records of 76 cows, grouping them according to their 2-year-old records, and noting the relation that exists between the yields at this time and those of from 2 to 5 lactation periods later.

There is evidently a direct relation, for the cows low in milk fat yield as 2-year-olds held a similar position at later dates, and the same was true for the medium and high producers. There was no wide variation, however, within the several groups, the cows as a rule coming fairly close to the general average. It is stated that "on the average a dairy cow as a 2-year-old may be expected to produce about 70 per cent, as a 3-year-old around 80 per cent, and as a 4-year-old around 90 per cent of the milk and butter fat she will produce under the same treatment when mature."

Importance of the sire in breeding for body weight and milk production, R. G. BRUCHHOLZ (*Sächs. Landw. Ztschr., 61 (1913), No. 26, pp. 363-366*).—The author discusses wherein immediate ancestry affects the body weight and milk production of cows, and gives tables showing the results of studies of the herd book records of a large number of animals.

Cost of milk production, A. MANNING and H. H. JONES (*N. Y. Dept. Agr. Bul. 35, 1912, pp. 1043-1052*).—These are general articles dealing with the cost of milk production under New York conditions.

The composition of milk, H. D. RICHMOND (*Analyst, 38 (1913), No. 447, pp. 252-255*).—A report of analyses of 11,677 samples of milk in 1912, in which the morning milk had an average specific gravity of 1.0321, 12.37 per cent of total solids, and 3.51 per cent of fat. The corresponding values for evening

milk were 1.0318, 12.70, and 3.85. The late spring months showed the lowest percentage in fat, the highest being in November. See also previous work (E. S. R., 28, p. 274).

Investigation into the composition of certain brands of condensed milk, G. BROWNLEE (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 13 (1913), No. 2, pp. 307-310).—Analyses of condensed milk are reported and discussed.

Variations were found due to difference in composition of the original whole milk, the extent to which the condensation had been carried, the amount of added sugar, and, in the case of skim milk, the thoroughness of the skimming. The condensed milk was markedly lower in total solids, fat and protein content than cow's milk. It is thought that full-cream condensed milk is suitable for infant feeding when used for short periods only. Machine-skimmed milk is regarded as unsuitable for babies, and the author suggests that condensed milk from such milk be so labeled.

The care of cream, A. E. PERKINS (*Ohio Sta. Circ.* 134, pp. 55-57, figs. 8).—A popular discussion of the conditions affecting the quality of cream and butter, including items on the cow and her surroundings, dairy house equipment, care of milk, cream, and dairy utensils, cream grading, and cream testing.

A method for the improvement of buttermilk from pasteurized cream, L. LANG (*Illinois Sta. Circ.* 166, pp. 7, fig. 1).—This circular gives a description of a method whereby buttermilk from pasteurized cream may be improved in flavor and body for commercial use by adding a culture of *Bacillus bulgaricus* to the buttermilk at a temperature of from 95 to 100° F. The culture is made from clean fresh skim milk, pasteurized at 185° for from 6 to 10 hours, or from skim-milk powder. From this a bulk culture is then made. For the commercial product from 10 to 15 gal. of bulk culture are added to 100 gal. of pasteurized buttermilk, depending upon the condition of the buttermilk and the acidity desired. The resulting acidity is between 0.65 and 0.85 per cent.

Creamery organization and management, R. C. JONES (*Montana Sta. Circ.* 23, pp. 67-74).—This suggests plans for the organization and management of a local cooperative creamery and contains general advice to buttermakers and creamery managers.

The manufacture of cheese from heated milk, M. BENSON and R. H. EVANS (*Jour. Bd. Agr. [London]*, 20 (1913), No. 4, pp. 281-301, fig. 1).—Laws requiring the pasteurization or heating of milk to such temperatures as will destroy the bacilli of tuberculosis have been regarded as antagonistic to the cheese-making industry, as because of physical and chemical changes milk heated to such temperatures partially loses its coagulative properties and its value for cheese making. With a view to determining the possibility of manufacturing cheese from pasteurized milk, experiments were conducted with milk heated to various temperatures by a process known as "instantaneous pasteurization" with the following conclusions:

"It is possible to make Cheddar cheese, capable of scoring 87 to 94 per cent of points for merit, from milk which has been pasteurized to temperatures ranging from 190 to 200° F. Carbonic acid gas, artificially added to milk during pasteurization, improves the coagulative properties of milk to a considerable extent when the lower pasteurizing temperatures are employed, but it was noticeable that the gas had not this beneficial effect upon the coagulation in the pasteurizing temperatures above 180°. Carbonic acid gas appeared to serve a useful purpose in preventing bitterness, a fault which occurs sometimes in pasteurized milk cheeses, more especially in their earlier ripening stages. Cheeses made from milk treated with carbonic acid gas were found to fail in color (as regards the color of the cheese internally). The cheeses made from

the nonpasteurized milk were very obviously more clear in color and gained more points in this respect.

"As compared with cheeses manufactured from raw milk, those made from pasteurized milk are softer and more plastic in texture, while they also appear to be more soluble; and these properties give the impression that there is a high percentage of butter fat present in the composition of the cheese. The flavor of the pasteurized milk cheese is milder, and where milk is pasteurized at the lower temperatures there is decidedly more uniformity in flavor throughout a whole 'make' or group of cheeses. Pasteurized milk cheese is longer in ripening. It requires to be ripened for periods ranging from 4 to 6 months, according to the temperatures at which the milk is pasteurized. The ripening is slower as the pasteurizing temperature increases. Cheese made from pasteurized milk possesses better keeping qualities than that from raw milk.

"As regards the weight of ripe cheese produced, the figures show that there is a great increase in weight (from 5 to 9 per cent) in favor of pasteurization at the higher temperatures; there is evidence also that there is less loss by evaporation in the case of the pasteurized milk cheese. This applies also to the ripe cheese when it is cut. The risks in manufacture are greater, more especially where high pasteurization temperatures are employed, and it is certain that considerable skill is required on the part of the cheesemaker. . . . It is safe to assume that any tubercle bacilli which may be present in the milk will fail to survive the pasteurization of milk at temperatures ranging between 185 and 200° F. . . . The pasteurization of milk against tubercle bacilli can be rendered equally complete at lower temperatures than 185° so long as the milk is held or 'retained' at these temperatures for a definite period in a retainer, a utensil which is coming into popular use."

A description of the method of pasteurization and of cheese making under these conditions is included in this article.

Maturing cheese by electricity (*Dairy*, 25 (1913), No. 293, p. 132).—An account of an electrical method of curing cheese in use in Rotterdam. Fresh cheese is subjected to an alternating current for 24 hours, after which it is said to possess all the consistency, taste, and appearance of a fine 2-year-old cheese.

Homemade cheese, MRS. J. R. WILEY (*Enid, Okla.*, 1913, pp. 16, figs. 2).—A practical account of a method used in making homemade cheese.

The marketing of Wisconsin cheese, H. C. TAYLOR, W. A. SCHOENFELD, and G. S. WEHRWEIN (*Wisconsin Sta. Bul.* 231, pp. 46, figs. 22).—This bulletin, prepared for the State Board of Public Affairs, deals with the economic phases of the marketing of Cheddar cheese, and presents data on the distribution of factories in the State, the relation of producer to consumer, the operations of the dairy boards, cheese warehouses, the extent and distribution of shipments from the State, and the fluctuation in prices paid for cheese.

It is concluded that farmers have too generally left the selling of their product to the cheesemaker, that the dealers buy more than 90 per cent of the cheese privately, and that the cheese dealers and packers are important agencies.

The farmers can help improve the system of marketing cheese by participating in the sale of their product instead of leaving it to other parties whose interest is not in harmony with their own.

The State can help improve conditions by studying the present systems of marketing, by furnishing timely information regarding methods of marketing, and the condition of the market, and by regulating any unjust acts or charges which may arise in the marketing of farm products.

West country cheeses, FLORA M. FRIDAY ET AL. (*Jour. Roy. Agr. Soc. England*, 73 (1912), pp. 25-37).—An account of the history, manufacture, and qualities

of Single and Double Gloucester, Caerphilly, Dorset Blue, and North Wilts cheeses.

Manufacture of dried casein (*Dairy*, 25 (1913), No. 293, p. 134).—An account of methods used in manufacturing dried casein from skim milk and buttermilk. It is suggested that for large concerns such a product would prove a source of considerable profit.

VETERINARY MEDICINE.

A course in normal histology, R. KRAUSE, trans. by P. J. R. SCHMAHL (*New York*, 1913, pts. 1, pp. X+86, figs. 30; 2, pp. X+406, pls. 98).—This is a guide for practical instruction in histology and microscopic anatomy, and deals with human and animal organs and tissues. The first part considers histological technique, which is presented in detailed form. The second part gives a terse description of the tissues, and is profusely illustrated with colored plates.

Studies from the Rockefeller Institute for Medical Research (*Studies Rockefeller Inst. Med. Research*, 17 (1913), pp. VII+624, pls. 30, figs. 30).—These are reprints of work published by members of the staff of the Rockefeller Institute for Medical Research in American and European journals. The topics dealt with are in the fields of bacteriology, therapeutics, chemistry, pathology, physiology and pharmacology, surgery, and experimental biology.

Annual report of the civil veterinary department, United Provinces, for the year ending March 31, 1913, C. W. WILSON (*Ann. Rpt. Civ. Vet. Dept. United Prov.*, 1913, pp. II+22).—This annual report includes accounts of the occurrence of contagious diseases of animals, breeding operations, etc.

Diseases prevalent among horses and cattle in Mississippi, E. M. RANCK (*Mississippi Sta. Circ.*, 1913, July, pp. 3-22).—A brief popular account is given of the diseases commonly met with among horses and cattle in Mississippi.

Trypanosomiasis in horses, and trypanosomiasis and tuberculosis in camels, F. E. MASON (*Dept. Pub. Health [Egypt]*, Paper 5, 1912, pp. 10).—This report deals briefly with experimental treatment of trypanosomiasis in camels, tuberculosis in camels, trypanosomiasis in horses, distomiasis in sheep, coccidiosis in a Cyprus bull, and larvæ of *Linguatula tanioides* in camels.

The treatment of grass land with a view to the elimination of disease, J. PENBERTHY (*Jour. Roy. Agr. Soc. England*, 73 (1912), pp. 73-90).—This discussion of the subject relates to animal diseases.

A review of the present situation as regards infectious protozoa, F. TIDSWELL (*N. S. Wales Rpt. Govt. Bur. Microbiol.*, 2 (1910-11), pp. 62-70).—A summarized account.

A systematic study of the Coccaceæ in the collection of the Museum of Natural History, I. J. KLIGLER (*Jour. Infect. Diseases*, 12 (1913), No. 3, pp. 432-452).—"The 54 strains of the cocci in the American Museum collection group themselves very definitely according to pigment production and other characters into 5 distinct classes. The correlation of the various morphological and biochemical properties bears out the work by the Winslows [*E. S. R.*, 20, p. 1079] and justifies their recognition of 5 genera among the Coccaceæ outside of the diplococci and streptococci."

The use of formalinized sheep cells in complement fixation tests, E. P. BERNSTEIN and D. KALISKI (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 13 (1912), No. 5, pp. 490-495; abs. in *Centbl. Bakt. [etc.]*, 1. Abt., Ref., 54 (1912), No. 19, p. 585).—The addition of formalin in concentrations of from 1:800 to 1:200 preserves sheep and human blood for 8 weeks. The antigenic power of the blood corpuscles and their utilization for the complement fixation test is not destroyed. In a dilution greater than 1:300, formalin when added to the hemolytic system does not influence the corpuscles or amboceptors, and the

complement only slightly. Washed blood corpuscles (50 per cent suspension) are conserved for at least 3 to 4 weeks by this preservative.

In regard to the recent work of Bernstein and Kaliski, P. ARMAND-DELILLE and L. LAUNOY (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 17 (1913), No. 3, pp. 361, 362).—A polemic in regard to the priority of the above work.

An epidemic disease in rabbits resembling that produced by *Bacillus necrosis* (Schmorl), but caused by an aerobic bacillus, J. M. BEATTIE, A. G. YATES, and R. DONALDSON (*Jour. Path. and Bact.*, 18 (1913), No. 1, pp. 34-46, pls. 2).—These studies relate to a fatal epidemic disease which occurred among rabbits during the summer of 1911 in the animal house connected with the pathology department of the University of Sheffield. It is said to resemble closely the disease experimentally produced by the inoculation of Schmorl's bacillus, and to be caused by a bacillus which in many of its morphological characters is similar to *B. necrosis*, but which differs from it in its motility and its aerobic character.

A note on the maintenance of virulence by *Bacillus abortus*, F. M. SURFACE (*Jour. Infect. Diseases*, 12 (1913), No. 3, pp. 359-363).—Cultures of *B. abortus* originally obtained from the Veterinary Serum Laboratory in Copenhagen were found to have maintained their original virulence after more than 2 years' growth under laboratory conditions. Blood tests made at various intervals showed the appearance of antibodies 14 days after inoculation or about 5 weeks before the abortion. It was found that 0.5 per cent of carbolic acid was not sufficient to kill this organism.

Contagious abortion in cows, F. TIDSWELL (*N. S. Wales Rpt. Govt. Bur. Microbiol.*, 2 (1910-11), pp. 44-48).—This article deals with the characters of the disease, characters of the microbe, modes of dissemination, treatment, and legislation.

Foot-and-mouth disease in Ireland (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 13 (1912), No. 1, pp. 132-135, pl. 1).—This relates to the outbreaks which have occurred in Ireland since June 30, 1912, following a complete immunity from the disease for a period of over 28 years.

The agglutination of the glanders bacillus by normal horse serum, A. M. OYUELA (*Compt. Rend. Soc. Biol. [Paris]*, 72 (1912), No. 21, pp. 929, 930; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 55 (1912), No. 16, pp. 488, 489).—The sera of sound horses often agglutinate the glanders bacillus, and in some instances in very high dilution. Tests were conducted with unheated sera and sera heated to 56° C. It was found that out of 28 sera, 3 agglutinated up to a dilution of 1:500, while of the heated sera only 5 agglutinated in a dilution of from 1:100 to 1:200. The author recommends the use of heated sera for the test.

Results with the diagnostic methods for glanders in Austria in the year 1910, J. SCHNÜRER (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 10 (1911), Nos. 5, pp. 321-341; 6, pp. 408-442, pl. 1, fig. 1).—In this investigation sound, doubtfully sound, and occult and clinically diseased horses were examined.

Of all the methods utilized for diagnosing occult glanders, viz., agglutination, precipitation, complement fixation, anaphylaxis, and the mallein tests, the only one which came up to the 3 requirements given below was the mallein-ophtho-mo reaction. The 3 requirements are (1) it must be practicable for use in gross examinations, and must take the least possible time; (2) it must be so arranged that it can be employed by any veterinarian; and (3) in the hands of those unskilled it should yield accurate results.

The conjunctival reaction for glanders (ophthalmic test), K. F. MEYER (*Jour. Infect. Diseases*, 12 (1913), No. 2, pp. 170-190; *Amer. Vet. Rev.*, 43 (1913), No. 3, pp. 233-251).—Inasmuch as mallein, when subcutaneously ap-

plied, will give a more pronounced local reaction than is obtained with tuberculin, better results are to be expected in glanders than in tuberculosis. As a result of some preliminary experiments with "mallein brüte" of the Pasteur Institute and some similar preparations made in the author's laboratory for the eye test, it was decided to use a preparation like "mallein siccum," prepared according to Foth's specifications,² which is described. A preparation of this kind contains more specific antigens than the usual malleins, and is consequently of value for detecting especially occult cases of glanders. In the original article the technique for applying the reaction is given in detail. The reaction usually remains visible for from 12 to 36 hours after the application of the biologic product, but for this there is no absolute rule, since it has been present only 6 hours after one test and in other instances it remained visible for 72 hours.

The atypical (Schnürer) reactions were found to occur not uncommonly, "viz, the conjunctival test appears and disappears suddenly, or the reaction is distinct only after 24 hours." In a sensitized eye the reaction was found to be more legible than in an unsensitized one.

From the records of about 400 healthy horses, it was shown that a conjunctival test does not sensitize so long as the animal is not affected with glanders. Several of the horses were tested 3 and 4 times. "Differing from the tuberculin test, the retest can be applied 24 hours after the first application, a very decided advantage under present conditions of city veterinary sanitary police, where in large stables a final decision is immediately desired. In most cases in which the first reaction was doubtful, a distinct or negative result was seen after the second test. Still, in 2 horses, which probably were in the stage of incubation, no reaction was obtained in either test. All observations stand in correlation with similar ones of Miessner, Schnürer, etc.

"In many stables all horses, including reacting (occult) ones, were retested a third time after 14 days, for the purpose of detecting such animals as were in the stage of incubation at the first and second tests, and of excluding the possibility of a simulated reaction in the reacting horses. Only when this third conjunctival test again gave negative results were the horses considered to be free from glanders. On making this third test, and in 1 stable after a fourth and a fifth test, it was observed that the degree of reaction became less and less distinct. Only a slight conjunctivitis was noted in animals which at first gave classic reactions. For these reasons more than 3 retests should not be applied. The mallein probably does not cause accumulation of leucocytes, and therefore no inflammatory process, on account of the adaption of the cells to the biochemic changes or on account of absence of complement concentration."

The author coincides with Fröhner (E. S. R., 27, p. 578) in regard to preferring the ophthalmic test to the complement fixation and agglutination tests on account of the earlier positive results which it records. "Many horses were tested by the subcutaneous method and afterward by the ophthalmic method, and in no instance was a reaction noted when the horse was not infected with glanders. The ophthalmic test in most of the experimental cases followed the subcutaneous one in the next 24 hours. In several instances 10 to 24 days elapsed before an ophthalmic test was made, and still no reaction was noted. In our experience the subcutaneous test does not influence a subsequent conjunctival test applied in the next 24 hours, a point which may be of great assistance to the practitioner. In an easy manner a doubtful temperature reaction can be checked by the ophthalmic test. . . .

"The results show that of 210 horses, 58 were found by means of the complement fixation test to be suffering from glanders. The interpretation of this

test is based on the principle as outlined by Miessner and others and shown in my publication on this subject. Statistical investigations show that 99.6 per cent correct results in glanders, and 99.75 per cent in healthy horses are obtained with the complement fixation test. Of the 58 glanders cases, only 56 reacted positively to the conjunctival test, while 2 horses which proved at post-mortem to be affected with glanders did not give any reaction whatever. On account of the positive serum reactions, both animals were condemned and, therefore, a third retest at 14 days' interval could not be carried out. The 2 animals were, according to the history and the result of the serum tests, in the stage of incubation and would probably have shown a positive reaction on a third retest. In 1 experimental horse, conditions observed by Müller, Gaeltgens, and Aoki were therefore existing, namely, in quite recent infections the conjunctival tests may be negative and occur only several days after the appearance of the antibodies in the serum of the patient. Whether or not this is an exception has to be determined by further observations. We found lately that these conditions are rare. The retest, 14 days after the first test, gave, with a few exceptions, distinct results. . . .

"In horses that are maliciously injected with mallein to veil the results of a subsequent test by a state official, the conjunctival test will be of great assistance in disclosing the true condition. . . . The serum tests are necessary to centralize the control of infectious diseases in a reliable state institution and to support the diagnosis in case compensation is sought by the owner of the animal. Only the complement fixation test can be used independently for the diagnosis of glanders."

The degree of the reaction and a plan which has been used with success in Pennsylvania for reporting the results are given.

A treatise on rabies, V. BABES (*Traité de la Rage. Paris, 1912, pp. VI+677, pls. 6, figs. 11*).—This work summarizes the present knowledge of this disease.

Salvarsan in experimental rabies, F. M. MARRAS (*Centbl. Bakt. [etc.], 1. Abt., Orig., 70 (1913), No. 3-4, pp. 190-192*).—In the author's experiments salvarsan had no immunizing effect, whether administered 12 or 18 hours to guinea pigs, or thereafter to mice and rats, following the inoculation of fixed and of street virus. The intravenous injection of salvarsan at the commencement of the paralysis following an infection with fixed or street virus did not cure either rabbits or dogs.

Salvarsan against anthrax and rabies, M. ISABOLINSKY (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 17 (1913), No. 3, pp. 353-360*).—Salvarsan was found to be very effective for rabbits treated with lethal doses of anthrax bacilli. Its therapeutic value can be increased by giving a curative serum in connection with it. For rabies it is deemed of no value.

The treatment of tetanus, C. T. MCCLINTOCK and W. H. HUTCHINGS (*Jour. Infect. Diseases, 13 (1913), No. 2, pp. 309-320*).—The studies here reported were undertaken with a view to determining as far as possible, with animals, the relative value of the various methods of treatment of tetanus. The authors consider the following conclusions to be warranted by the experiments reported:

"Amputation after the appearance of symptoms is of no value. The toxin appearing in the blood stream is self-limited even in the fatal cases. There is little if any value in the carbolic acid treatment of the disease. If there is any gain, our opinion is that it is probably due to the sedative action of the drug and not to any direct action on the disease process, and that this result may be obtained with greater certainty by other drugs. The magnesium sulphate as used in our experiments, subcutaneously, is of no value. Antitetanic serum alone has a definite, although usually insufficient, curative effect.

"It appears to us from the observation of a large number of animals and quite a number of human beings dying of tetanus that the exhaustion due to the muscular contractions is a large factor in producing fatal results. For this reason much of our work has been given to the attempt to hold these convulsions in check. The presence of a large amount of toxin in the blood several days (in sheep it can be demonstrated 4 days) before the onset of clinical symptoms makes it imperative that a method be devised for easily determining this. With such a method it is quite probable that we could save a large proportion of our tetanus cases.

"With our present knowledge of the subject, the best that can be done in the treatment of tetanus is to neutralize the toxin with repeated doses of serum while controlling the muscular spasm with some such drug as chlorbutanol."

On the adult forms of *Trypanosoma americanum* in naturally infected animals, F. M. JOHNS (*Amer. Jour. Trop. Diseases and Prev. Med.*, 1 (1913), No. 1, pp. 49-59, pl. 1).—This paper presents a description of forms found in the blood of naturally infected animals, the technique for their demonstration, and the points brought out in cultural studies.

Of 43 adult cattle and 7 yearlings which were examined directly, all of the cattle and 2 of the yearlings were found infected.

Treatment of calf dysentery, J. MÜNICH (*München. Tierärztl. Wchnschr.*, 56 (1912), No. 26, pp. 465-470; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 55 (1912), No. 16, p. 506; *Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 26, p. 471).—A number of animals in various barns were vaccinated with a germ-free bacillary extract of the causative organism. In most cases the results were beneficial. In 1 barn they were entirely negative.

The tick-killing properties of sodium arsenate, W. F. COOPER and H. E. LAWS (*Agr. Jour. Union So. Africa*, 5 (1913), No. 5, pp. 716-721).—The authors' work demonstrates that sodium arsenate has some tick-killing action, although its power is not more than 50 per cent of that of sodium arsenite.

"It is obvious that to judge the activity of a dip solely on its content of sodium arsenite (as, for example, by means of the isometer) is to incur risks of a very serious nature, especially when oxidation has taken place to any great extent. The only true test of the activity of a cattle dip is to test it on tick-infested cattle, when it will be found that even those dips which contain exactly the same quantity of sodium arsenite as well as arsenate are not all equal in effect. In any case any testing of the activity of a dip which takes no account of the tick-killing action of sodium arsenate can give only false results and should not be adopted under any circumstances."

Vaccination against sheep pox by means of a sensitized virus, J. BRIDRÉ and A. BOQUET (*Compt. Rend. Acad. Sci. [Paris]*, 154 (1912), No. 3, pp. 144-146; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 53 (1912), No. 18, p. 572).—The virus is exposed for 48 hours to the action of Borrel's antisheep-pox serum. After this treatment it loses its virulency, and if a sheep is injected subcutaneously with the attenuated virus, only a local reaction occurs. Of the 300 animals treated in this manner 80 per cent showed a local reaction without any open wound remaining. The vaccine, according to the authors, gives certain protection and is without danger to the animal. The local reaction is considered specific because sheep not having the disease will not react. Immunity is established 48 hours post vaccination.

Vaccination against pox in sheep by a sensitized virus, J. BRIDRÉ and A. BOQUET (*Compt. Rend. Acad. Sci. [Paris]*, 154 (1912), No. 19, pp. 1256, 1257).—The process of vaccination by a sensitized virus, reported upon in the above abstract, is considered a very efficacious prophylactic method for securing im-

munity against this disease. Its application in places like Algiers, where sheep pox is enzootic, has shown very satisfactory results.

Sensitized vaccines.—Vaccination against sheep pox without pustulation by the use of sensitized pustules, L. PANISSET (*Rev. Gén. Méd. Vét.*, 19 (1912), No. 222, pp. 318–322; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 53 (1912), No. 18, p. 572).—The author maintains that the value of Bridré and Boquet's method for immunizing against sheep pox with sensitized virus should be reinvestigated. He utilizes the edematous fluid from the pustules, which is strongly centrifuged, and the sediment obtained is mixed with the sera from immunized sheep and exposed for 3 days to a temperature varying from 15 to 18° C. The sediment is then collected with the aid of the centrifuge and mixed with a sodium chlorid solution in a dilution of 1:100. After centrifuging off the larger particles this suspension is used as the vaccine in doses of 0.25 cc. for each sheep.

The advantage of this method over the active immunization process is that no vaccination pustules develop and the immunity sets in 24 hours after vaccination.

Poliomyelitis in sheep suffering from "loupin' ill," J. P. MCGOWAN and T. RETTIE (*Jour. Path. and Bact.*, 18 (1913), No. 1, pp. 47–51, pl. 1).—It is pointed out that the term "loupin' ill" or "trembling" is used popularly to designate a single disease of sheep in Scotland, but in reality covers several different diseases, including one which for ease of discussion the authors term poliomyelitis. In the districts and in the seasons in which they studied "loupin' ill" they found that the term, in at least 95 per cent of the cases in lambs, signified navel and joint ill. "The disease which we designate as poliomyelitis of the sheep has a prodromal stage in which the animal exhibits the symptoms associated with the febrile state. The temperature of the animal is raised; it does not feed; it separates from the flock; it hangs about, mopes, and is listless, is constipated, and has usually signs of slight respiratory catarrh, exhibited chiefly by slight running at the nose. . . . As regards the pathology of this condition, we believe it to be a general disease of the whole body, a particular seat of election for the action of the virus being the central nervous system. In our view, it closely corresponds in its clinical symptoms and pathological anatomy with acute poliomyelitis in man."

Cultures on blood agar from the cerebro-spinal fluid of a number of acute and chronic cases alike gave negative results, as did inoculation experiments.

Studies on the virus of hog cholera, W. E. KING, F. W. BAESLACK, and G. L. HOFFMANN (*Jour. Infect. Diseases*, 12 (1913), No. 2, pp. 206–235, figs. 33).—This is a continuation of the preliminary work previously reported (E. S. R., 28, p. 381) in which the results obtained by von Betegh (E. S. R., 28, p. 381) are questioned. Balfour has pointed out that in normal blood there often occur dumb bell, chain, droplet, or flexible filament-like bodies which can be easily mistaken for spirochetes by the untrained observer.

The results of this investigation showed that the blood of 48 normal hogs was relatively free from granules, and where granules were found they were traced to crushed leucocytes. "The examination of the blood of all hogs (40 animals) which were suffering from hog cholera revealed the presence of a spirochete. All specimens of blood from these animals, during the height of the disease, contained characteristic granules. Negative dark field findings followed positive findings in the case of 6 hogs which recovered from the disease. The blood of 2 naturally immune hogs was free from spirochetes and granules.

"The spirochetes and granules have been observed in hogs infected with 12 different strains of virus, as follows: Bureau of Animal Industry, Michigan

(Demerick), Michigan (Rochester I), Indiana I, California (Hall), Ohio (Pettigrew), Ohio (Hazen), Ohio (Heinz), Kansas I, Unknown, California (University), and Michigan (Rochester II).

"Hog cholera was diagnosed in 2 small herds of hogs, after receipt of the animals at the laboratory, by means of the dark field examination of the blood. In other instances, positive dark field findings were secured a few hours before any symptoms appeared. The spirochetes were found with less difficulty in the blood of hogs suffering from the acute form of the disease. In 2 experiments the spirochetes were demonstrated in horse serum virus. Spirochetes are uniformly demonstrable in the intestinal ulcers of hogs dead from cholera."

Spirochaeta suis is suggested as a name for the organism.

Some experiences with hog cholera, F. F. PARKER (*Amer. Vet. Rev.*, 43 (1913), No. 3, pp. 287, 288).—Hog cholera and swine plague have been very prevalent in Mahaska County, Iowa, for the last 2 seasons, and during the last 4 months some farmers have lost their entire herds. In 1 instance a herd of 65 animals, in which there were from 12 to 15 sick shoats, was treated with antihog cholera serum. Two-thirds of the animals died. In another herd 100 head were treated, and two-thirds survived; and in a nearby establishment 21 shoats not sick were immunized with serum alone and no deaths resulted.

A further group of animals, consisting of 58 shoats, 7 brood sows due to farrow in a few days, and 1 male hog weighing 600 lbs., were vaccinated. All were perfectly healthy. The double vaccination method was used. "In 3 or 4 days from this time these sows farrowed 69 live, healthy-looking pigs. On the eighth day after vaccination every hog became sick except 2, the largest sow and the boar. . . . These hogs had every symptom of virulent hog cholera, the characteristic fetid feces, the catarrhal discharge from the nose and eyes, and red spots on abdomen and ears, these spots turning purple before death. Some died in a few days, others lingering for 3 or 4 weeks. All but 17 of the 58 shoats died, 3 of the sows and all of the 69 little pigs."

The last herd vaccinated consisted of 135 head which were unloaded by mistake from the cars into a packing company's pen which was never free from animals having cholera. These animals were vaccinated with serum only and were shipped to their destination. None of the hogs were lost.

A practical treatise on horseshoeing, J. TASSET (*Traité pratique de Maréchalerie*. Paris, 1913, pp. 480, pls. 237; rev. in *Amer. Vet. Rev.*, 42 (1913), No. 5, p. 497).—A practical work.

The rate of reproduction of various constituents of the blood of an immunized horse after a large bleeding, R. A. O'BRIEN (*Jour. Path. and Bact.*, 18 (1913), No. 1, pp. 89–98, figs. 4).—"After the withdrawal of 10 liters of blood from an immunized horse, the fluid first appearing in the blood vascular system contains an amount of protein far above the normal, hemolysin and diphtheria antitoxin are reproduced at different rates, and the rate of reproduction of the various proteins in the blood is probably associated therewith."

Equine piroplasmosis in Panama, S. T. DARLING (*Jour. Infect. Diseases*, 13 (1913), No. 2, pp. 197–202, pl. 1).—This is a detailed report of studies of which a preliminary account has been previously noted (*E. S. R.*, 29, p. 483). It is stated that there is a disease among horses in the interior known as anthrax, and that there can be no doubt but that equine piroplasmosis is endemic in this region among native animals.

Bacillus bronchisepticus.—Its relation to canine distemper, N. S. FERRY (*Amer. Vet. Rev.*, 43 (1913), No. 1, pp. 16–30).—Previously noted from another source (*E. S. R.*, 27, p. 782).

RURAL ENGINEERING.

Principles of irrigation engineering, F. H. NEWELL and D. W. MURPHY (*New York and London, 1913, pp. XIII+293, pls. 16, figs. 52*).—In this work, primarily intended for students and engineers, it is attempted to treat in a comprehensive manner the general principles involved in considering the feasibility of, and in planning, constructing, and operating, irrigation systems. Chapters are included on irrigation, irrigable lands, water supply, design and construction of canals, canal structures, distribution systems, irrigation by pumping, drainage, operation and maintenance, storage works, reservoir sites, dam sites, timber dams, earth dams, rock-fill dams, masonry dams, outlet works, water rights, and economic features of irrigation.

Irrigation works in India, J. BENTON (*Jour. Roy. Soc. Arts, 61 (1913), No. 3160, pp. 717-754, figs. 10*).—This paper reports the physical and financial condition of irrigation works in India during the 25-year period ended with 1912, including those works in operation and those under construction. Diagrams and tables of data are given which show the results attained by the irrigation works of each Province.

A summary of the developments effected on the works, now in operation, during the 24 years ended in 1911, shows that the percentages of advancements during this period were as follows: On capital outlay, 55 per cent; irrigated area, 68 per cent; net revenue, 123 per cent; return on capital outlay, 43 per cent; and net profit, 200 per cent. After meeting all charges for maintaining and operating the works the net profit which accrued to the government during the 24-year period was £35,870,835 (\$174,332,258), which it is stated more than repaid the entire outlay on the works in operation.

Measurement of water, R. D. KNEALE (*Montana Sta. Circ. 24, pp. 75-133, figs. 19*).—This is a revision of Bulletin 72 of the station (E. S. R., 20, p. 388) to which has been added a study of the measurement of water through submerged orifices or conduits, for which formulas and tables of constants are given.

Artificial controls of stream gaging stations, C. R. ADAMS (*Engin. News, 69 (1913), No. 26, pp. 1308-1311, figs. 11*).—In precise stream gaging work the United States Geological Survey has introduced an innovation in gaging stations for determining the fall of small streams in rough beds by constructing small barriers of concrete or of rubble leveled off with cement mortar to provide stable channel conditions. The results of experiments show that a particular type of control is necessary for particular needs, but that standard ratings for particular types are valuable.

Three different types of stream controls are described, and rating curves are given for each type and for a stream having natural control. From a comparison the advantages of artificial control are enumerated as follows: (1) Fewer current meter measurements are required for the initial rating. (2) The initial rating is of increased accuracy. (3) The rating curve is permanent and not subject to change from erosion or sedimentation. (4) Temporary inaccuracies, due to back water or channel storage, are obviated. (5) Winter estimates of flow can be made with precision. (6) Doubtful accuracy is avoided, the station is easily inspected for any derangement, and greater latitude of station location is possible.

Report of progress of stream measurements for the calendar year 1911, F. H. PETERS and P. M. SAUDER (*Dept. Int. Canada, Sess. Paper No. 25d, 1913, pp. V+311, pls. 43, figs. 2*).—This report outlines the methods in present use for obtaining and compiling data on drainage basins and gives a large amount

of stream flow and other data from the gagings and hydrographic surveys of 31 drainage basins.

Appendixes to this report are a Report on the Field Work in the Wood Mountain District, during 1911, by N. M. Sutherland; Report on the Winter Conditions in the Banff District during the Winter of 1911-12, by V. A. Newhall; and Description of an Apparatus for Adjusting the Length of the Crest of a Steel Rectangular Weir, by G. H. Whyte.

Distribution of water, R. J. VAN REENEN (*Agr. Jour. Union So. Africa*, 5 (1913), No. 5, pp. 721-726).—The author points out the advantages and disadvantages of 4 systems of distributing irrigation water, viz, the flooding, furrow, check, and basin systems, as applied to certain extreme conditions encountered in South Africa. He states that the check system, owing to the speed with which it may be used, is the most satisfactory where the source of supply is due to flood, and that for nonflood schemes where the irrigator may choose his own time and period of irrigation the flooding system is cheapest and most satisfactory.

In conclusion it is stated that distribution by rule of thumb is impossible because of the varying local conditions on adjoining farms, that irrigation should be followed by cultivation to produce an effective mulch and prevent waste, and that on any farm local conditions should be studied and one general suitable scheme of distribution be adopted once and for all.

Drainage of irrigated soils, V. MOSSÉRI (*Ann. École Nat. Agr. Montpellier*, n. ser., 12 (1913), No. 3-4, pp. 215-239, figs. 3).—This article deals with a system of drainage applied to irrigated alkaline soils on the Upper Egyptian Delta. The principle of this system is to interpose a deep seepage water drain between the land to be drained and the main surface water drain. The seepage drain is from 4 to 5 ft. deep and is fed by small underdrains from the center of each irrigated plat and which are laid between the irrigation laterals. A pumping plant is installed at the extremity of the drain so that the seepage waters are drawn off by mechanical power while the surface waters run off to the main drain by gravity.

In tests of this system the best results were obtained when the drains were placed at least 3 ft. deep and between 60 and 130 ft. apart, with the length of the plats between main seepage drains not more than 650 ft. Tests on 250 acres of rice land showed an average seepage of 400 cu. ft. per acre per 24 hours during low Nile and from 540 to 680 cu. ft. per acre per 24 hours during flood. On this basis a rotary pumping plant driven by an internal combustion engine was installed which was capable of removing from 570 to 710 cu. ft. of water per acre per 24 hours. The best success was obtained in rice fields, where conditions permitted, when the fields were flooded with as deep a layer of water as possible at each irrigation, as this, it is stated, brings about a thorough leaching and washing of the injurious salts from the soil.

Results of soil and drain water analyses show that the drainage water from this system is from 10 to 100 times richer in injurious alkaline salts than the water from the ordinary surface drain system. The results of crop experiments showed a greater indication of the beneficial action of combined leaching and drainage effected by this system.

It is stated that the actual cost of construction is from \$3 to \$3.50 per acre more than the cost of the ordinary system, that the loss of ground is from 2 to 3 per cent more, and that the cost of maintenance is from 5 to 10 per cent more. The general summary of all the tests of the system indicate that it is applicable in irrigated alkaline soils which have a sufficient fall for good surface drainage, but not for underdrainage from 4 to 5 ft. deep.

The theory of loads on pipes in ditches, and tests of cement and clay drain tile and sewer pipe, A. MARSTON and A. O. ANDERSON (*Iowa Engin. Expt. Sta. Bul. 31, 1913, pp. 181, figs. 40*).—Exhaustive investigations of drain tile and sewer pipe in ditches indicate that there have been a large number of failures by cracking in ditches, and that there is a wide prevalence of cracked pipe in existing sewers and drains, which is generally confined to pipes larger than 15 in. in diameter. It is stated that the principal cause of cracking of drain tile and sewer pipe in ditches is that sizes larger than 15 in. in diameter, as at present manufactured, are very generally too weak to carry the weight resting upon them for more than a few feet depth of the ditch filling and that many failures are caused by carelessness in bedding, refilling, and tamping. An exhaustive treatise on the theory of loads on pipes in ditches is followed by the results of actual tests, a comparison demonstrating the correctness and reliability of the theory of loads as developed.

Standard methods for testing drain tile and sewer pipe are described and specifications for drain tile and sewer pipe and pipe laying are given. The results of Iowa standard tests of over 1,000 specimens of cement and clay pipe, including sizes from 4 to 42 in. internal diameter, are given in tabular form. From these tests the following results and conclusions are stated: The moduli of rupture are often very high for small cement pipe as compared with the transverse strength of ordinary concrete beams several inches thick, but they average somewhat lower than those computed from transverse tests of curved beams cut from the shell of the same pipes. These curved beams show quite a large variation in the values of the modulus of rupture from point to point in the shell. The modulus of rupture is apparently higher for small thicknesses of cement tile than for large thicknesses. On account of the variation in the modulus of rupture with thickness, ordinary mathematical formulas for strength are not reliable for diameters of less than 18 in. in computing the increase in strength of cement pipe which may be secured by increasing the thickness of shells. For diameters of 18 in. and over the increase in strength, due to thicker cement pipe shells of the same quantity, should be a little less in proportion than the ratio of the squares of the thicknesses. The modulus of rupture of double strength vitrified clay sewer pipe of the large sizes is often much lower than the modulus of rupture of single strength pipe.

The absorption limits for drain tile and sewer pipe are given as follows: For farm tile 3 ft. deep, of cement, from 8 to 11 per cent maximum allowable absorption; farm tile 3 ft. deep, of clay, 8 to 16 per cent; large tile drains, of cement, $6\frac{1}{2}$ to 9 per cent; large tile drains, of clay, 6 to 7 per cent; and for clay sewer pipe 4 to 5 per cent.

In many cases drain tile and sewer pipe will break under permanent loads appreciably smaller than the breaking strength developed in laboratory tests in which the entire load is applied within a comparatively short time. Material loss of strength in cement pipe is caused by thorough wetting, as is also the case in some clay pipe.

A factor of safety of 1.65 is recommended for the required bearing strength of drain tile and sewer pipe. In the case of large pipe and fairly deep ditches, and where tests indicate that the strength of pipe is insufficient to prevent danger of cracking, the engineer should require either pipe of specially high strength or that the pipe be bedded in concrete. In case the ditches have hard bottoms the pipe-laying contractor should be required to shape the bottom of the ditch carefully to fit the lowest 90° of the pipe surface, and to bed carefully the pipe for this distance in sand or granular soil so as to secure a firm uniform bearing.

Action of the salts in alkali water and sea water on cements, P. H. BATES, A. J. PHILLIPS, and R. J. WIG (*U. S. Dept. Com., Bur. Standards Technol. Paper 12, 1913, pp. 157, pls. 8, figs. 45*).—The results of extended field and laboratory tests are given to determine the cause of the disintegration of concrete by the salts present in sea water and the alkali salts. Both chemical and physical investigations were made in the laboratory, and in addition to sea water, solutions of sodium chlorid, sodium sulphate, sodium carbonate, magnesium chlorid, magnesium sulphate, and ferrous sulphate, and also solutions in which there were present in equal parts by weight 2 of the salts, were used in the tests.

In the physical laboratory investigation there were 3 series of tests which consisted of making cement-mortar hollow cylinders closed at one end, $3\frac{1}{2}$ in. outside diameter and 10 in. high, with walls and base $\frac{1}{2}$ in. thick, and permitting various solutions to percolate through. The chemical investigations were made to determine the action of solutions on fresh and set cements. In the field investigations concrete of varied composition was made with Portland, natural, slag, and other special sea-water cements and exposed to sea water. Concrete briquettes were also tested for the purpose of comparing various types and brands of cement.

From these investigations the following results and conclusions are stated:

(1) Portland cement mortar or concrete, if porous, can be disintegrated by the mechanical forces exerted by the crystallization of almost any salt in its pores if a sufficient amount of it is permitted to accumulate and a rapid formation of crystals is brought about by drying; and as larger crystals are formed by slow crystallization there would be obtained the same results on a larger scale but in greater time if slow drying were had. Porous stone, brick, and other structural materials are disintegrated in the same manner. Therefore, in alkali regions where a concentration of salts is possible a dense nonporous surface is essential.

(2) While in the laboratory an hydraulic cement is readily decomposed if intimately exposed to the chemical action of various sulphate and chlorid solutions, field inspection indicates that in service these reactions are much retarded, if not entirely suspended, in most cases, due probably to the carbonization of the lime of the cement near the surface or the formation of an impervious skin or protective coating by saline deposits.

(3) Properly made Portland cement concrete when totally immersed is apparently not subject to decomposition by the chemical action of sea water.

(4) Concrete sets and permanently hardens as satisfactorily in sea water as in fresh water or in the atmosphere if it can be placed in the forms without undue exposure to the sea water while being deposited.

(5) Natural, slag, and other special cements tested in concrete mixtures showed normal increase in strength with age both in sea water and in fresh water.

(6) In the form of neat briquettes most of the Portland cements of high iron content, several of the cements of high or normal alumina content, and one special slag cement did not show any marked difference in tensile strength, whether exposed to fresh or sea water, for all periods up to 2 years. Other cements of various compositions showed signs of disintegration after a few weeks.

(7) All cements resisted disintegration in sea water better in mortar mixtures than in the form of neat briquettes. In most cases the mortar briquettes had normal strength up to 2 years' exposure.

(8) The physical qualities of the cement seem to determine its resistance to decomposition when brought into intimate contact with the sulphate and chlorid solutions.

(9) There is no apparent relation between the chemical composition of a cement and the rapidity with which it reacts with sea water when brought into intimate contact.

(10) In the presence of sea water or similar sulphate-chlorid solutions: (a) The most soluble element of the cement is the lime. If the lime of the cement is carbonated, it is practically insoluble. (b) The quantity of alumina, iron, or silica present in the cement does not affect its solubility. (c) The magnesia present in the cement is practically inert. (d) The quantity of SO_3 present in the cement up to 1.75 per cent does not affect its solubility, but a variation in the quantity present may affect its stability by affecting its rate of hardening.

(11) The change which takes place in sea water when brought into intimate contact with the cement is as follows: (a) The magnesia is precipitated from the sea water in direct proportion to the solubility of the lime of the cement. (b) The sulphates are the most active constituents of the sea water and are taken up by the cement. Their action is accelerated in the presence of chlorids. No definite sulphate compound was established. (c) The quantity of chlorine and sodium taken up by the cement is so small that no statement can be made as to the existence of any definite chlorid or sodium compound formed with the cement.

(12) The SO_3 added to a cement in the plaster to regulate the time of set is chemically fixed so that it will not go into solution when the cement is brought into intimate contact with distilled water.

(13) Metal reinforcement is not subject to corrosion if embedded to a depth of 2 in. or more from the surface of well-made concrete.

Reports of road engineers, J. H. PRATT ET AL. (*N. C. Geol. and Econ. Survey, Bien. Rpt. State Geol., 1911-12, pp. 21-56*).—This report illustrates the work that is being done by the road engineers of the State in giving special engineering assistance in the construction, maintenance, and repair of roads, culverts, and bridges to certain of the counties and townships, particularly noting cooperative work with the Office of Public Roads of this Department.

Tar spraying and tar macadam in situ, T. AITKEN (*Surveyor, 43 (1913), Nos. 1118, pp. 952, 953, 954, fig. 1; 1119, 978-980*).—The author relates the results of extended service experiments in the use of high-pressure tar spraying machines in surface treatment of macadamized roads and in making tar macadam in place.

Data from the maintenance and repair of several tar macadam roads by use of hand and gravity sprayers and high-pressure sprayers show an economy of as high as 9.25 per cent in some cases in favor of the high-pressure sprayer, and also that its use is an effective remedy against dust formation and lessens excessive internal wear.

The necessary operations are described for using high-pressure tar sprayers for making tar macadam in place. Tests of various binders with varying volumes of traffic indicate the existence of many inferior brands unsuited to the density of traffic, and indicate the advisability of adopting, by service tests, binders of varying degrees of quality to suit different classes of traffic and climatic and atmospheric conditions.

The "sticky" test for bitumens, C. B. OSBORNE (*Good Roads, n. ser., 5 (1913), No. 23, pp. 337, 338, fig. 1*).—A machine is described which has been designed by the California Highway Commission to measure the adhesive or binding property of road oil. The machine shows the stickiness or binding power of a thin film of oil between 2 cylinders, one of the cylinders being secured and the other being revolved by means of the pull of a given load, the thin film of oil acting as the resisting force to prevent this movement. The measurement

of this resistance is shown by the time in seconds required for 3 complete revolutions of the cylinder. The temperature of the oil on the cylinders is regulated by means of water pipes.

Tests of several road oils show a wide range of adhesive power. A wide range is also shown in the ratio of the float and viscosity tests to the adhesive tests, as in the case of 2 oils having about the same viscosity yet one being 5 times as adhesive as the other.

An oil of very slight stick property was tested to determine if it could be raised to the class of very sticky oil by the use of resin. On the addition of 10 per cent of resin the stickiness was increased about 3 times and with 25 per cent of resin added the stickiness was increased about 6 times. The results of several other adhesion tests of oils are given in tabular form.

It is concluded that the adhesion test is a valuable addition to the testing of road oil in that it gives new information in regard to one of the most important properties of oil.

Typical specifications for the fabrication and erection of steel highway bridges (*U. S. Dept. Agr., Office Pub. Roads Circ. 100, pp. 25*).—This circular has been prepared with the purpose of furnishing a suitable guide for local highway officials in fixing requirements to which bridge structures must conform. The specifications deal in particular with loads, proportions and unit stresses, floor system, details of design and construction, workmanship, materials, painting, concrete masonry, inspection and testing, and erection.

Power farming, R. OLNEY (*Laporte, Ind., 1913, pp. 56, pls. 9, figs. 42*).—This pamphlet gives suggestions for the selection and purchasing of mechanical power for the farm, and outlines in detail the methods of utilizing such power for draft and belt work.

The roller or packer, H. B. BONEBRIGHT (*Montana Sta. Circ. 21, pp. 27-32, figs. 6*).—The construction of 2 types of cement corrugated rollers is described, the first made with wheels of cement with bare faces and the second made with cement wheels having steel faces. In the second type the hubs are placed in position and the space between the rim and the hub filled with a wet mixture of 1:3 cement mortar. After curing the roller may be assembled, the molds being left on the wheels and forming a steel covering for them.

In the first type a wheel of wet wood is constructed, 4 in. thick and 19 in. in diameter from edge to edge with the rim in the shape of the letter V and the angle of the edge 90°. A wooden frame of 4 in. boards is then built around this circular form, and with this a concrete form, 4 in. thick and 27 in. square is made in 3 sections by filling in with a wet 1:2 mortar. By placing a hub in the center of this cement mold and filling the space between hub and mold with cement mixture the wheels are easily cast. For reenforcement a few rings about 14 in. in diameter of barbed or baling wire are recommended. It is suggested that the hubs be made of gas pipe cut 4 in. long. For sections of rollers not over 4 ft. long, 1½ in. pipe should be used which fits over a 1⅞ in. shaft, and for sections longer than 4 ft. 2 in., pipe should be used which fits over a 1⅞ in. shaft. Two spikes are inserted in opposite sides of the hubs through holes drilled for the purpose to prevent movement of the hub in the cement. The shafting should be cold rolled steel. For frames 4 by 6 in. hard or soft pine is recommended.

A portable grain-drying machine, F. HÖLTZERMANN (*Deut. Landw. Presse, 40 (1913), No. 46, pp. 554, 555, figs. 6*).—A novel grain-drying machine, which it is claimed has proved satisfactory in Russia, is described.

In the operation of this machine the grain is deposited in a hopper from which it passes to a circular plate inclosed in a sheet iron chamber and so perforated as to allow the passage of hot air, but not the grain. The grain falls on the

outer edge of the circular plate and is evenly distributed over its surface and slowly worked toward the center to an outlet by 3 sets of 8 small plows fastened to angle irons which revolve concentrically with the circular plate. A rotary fan and hot air pipes from a heater supply a continuous stream of hot air which enters the circular chamber at the top, passes down over the grain on the circular plate through the perforations, and out at the bottom of the circular chamber. The entire apparatus may be driven by horse, engine, or motor power. The amount of grain, the speed of the circular plate, and the temperature and velocity of the air current may be regulated to suit the kind of grain and its percentage of dampness.

The machine is made in 2 sizes, costing respectively about \$380 and about \$430. Data from service tests are given which show that the percentage of moisture in an average of 400 cwt. of grain was reduced from between 16 and 19½ per cent to between 10½ and 11½ per cent in a 10-hour day at a total average cost per hundredweight of about 3.6 cts., excluding interest and depreciation.

Small farm buildings of concrete (*Chicago, Pittsburgh, and Minneapolis, 1913, 2. ed. pp. 158, figs. 136*).—A second edition of this pamphlet (E. S. R., 28, p. 487).

Brief notes on modern silo construction, C. R. MORRIS and G. J. BOSMAN (*Agr. Jour. Union So. Africa, 5 (1913), No. 5, pp. 699-705, figs. 9*).—This article gives plans and brief specifications for the construction of reenforced concrete silos in South Africa and a note on silage.

For the most commonly used sizes of silo it is stated that the single 6 in. wall, reenforced vertically and horizontally, is the best type of construction. It is suggested that the vertical reenforced bars be spaced a maximum of 1 ft. 3 in., and the horizontal bars a maximum of 9 in. for the first 10 ft. and 12 in. thereafter.

[Silo construction] (*Hoard's Dairyman, 45 (1913), No. 20, pp. 707-710, 712, 714, 716-720, 730, figs. 41*).—Articles are included on the construction of Concrete Block Silos, by W. W. Smith: Erecting the Stave Silo, by A. L. Haecker; Building the Concrete Monolithic Silo, by W. E. Morton; A Brick Silo; Silo Building in the West, by H. E. McCartney; Minneapolis Panel Silo; The Gurler Silo; and The Underground Silo, by H. M. Bainer. Tables of construction, data, working plans, and illustrations are included in most of these articles.

Efficient poultry housing, G. J. SIMMONDS (*Manette, Wash., 1913, pp. 35, figs. 9*).—Plans and specifications with bills of material are given for the construction of octagonal and round poultry houses and their interior and exterior equipment, including food hoppers, nests, roosts, etc. In addition a note is given on poultry management in general.

A model fireproof farmhouse or country home, A. L. A. HIMMELWRIGHT (*New York, 1913, pp. 91, figs. 27*).—This pamphlet gives practical suggestions for the planning and construction of economical and durable farmhouses of fireproof material, and gives complete plans and specifications with bills of material for model 10 and 16 room buildings.

RURAL ECONOMICS.

The farmer's income, W. J. SPILLMAN (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 132, pp. 3-7*).—Notes and tabular data derived mainly from the census of 1910 and in part from certain factors worked out in studies of the Office of Farm Management are presented.

The crop farm income in the United States for 1910 is given as \$980.55; and the estimated expenses for labor, fertilizers, seed, etc., as \$340.15, making an estimated net farm income of \$640.40 per farm. Deducting from this \$322.18, which represents the interest on investment at 5 per cent, the remainder,

\$318.22, represents the labor income per farm. This includes unpaid family labor and all the farm furnishes toward the family living except milk and cream, but does not include income from outside sources, or the amount paid for live stock bought.

It is pointed out that a large percentage of American farmers live on the interest of their investment and do not receive anything for their own wages. It is suggested that the average income of the farmer could be increased by making the farms larger. This would reduce the number of individuals engaged in agricultural production but would not necessarily decrease production, for this could be maintained and even increased by better farm organization and the utilization of larger machinery and more power on the farm.

Cost of producing farm crops, W. R. PORTER (*North Dakota Sta. Bul. 104, pp. 59-117, fig. 1*).—This bulletin presents detailed data covering cost and economics of production as recorded at the New Salem and Bathgate demonstration farms.

The New Salem farm has had 5-year rotation, viz, corn, five wheat, oats or winter rye, oats and peas, and macaroni wheat. The cost of production per acre was as follows: Hard wheat \$7.54; Macaroni wheat \$8.26; oats \$6.06; oats and peas \$8.50; corn \$9.27; and winter rye (one year, 1912) \$7.58. The net profits were as follows: Hard wheat \$6.31; macaroni wheat \$6.86; oats \$2.95; oats and peas \$1.73; corn \$5.41; and winter rye \$7.70.

At Bathgate the rotation is clover or oats and peas; wheat; oats; corn; wheat; and barley, in which clover is seeded for the following year. The cost of production per acre was as follows: Wheat \$10.25; oats \$10.94; oats and peas \$11.95; corn \$11.12; barley \$9.94; and clover \$9.50. The net profits were as follows: Wheat \$8.64; oats \$5.01; oats and peas \$8.72; corn \$7.38; barley \$3.82; and clover \$23.75.

The sugar industry, F. J. SHERIDAN (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Misc. Ser., 1913, No. 9, pp. VII+127*).—This report is mainly a compilation of data relating to the cost of production of sugar cane and its manufacture into sugar in Louisiana.

The first part of the report deals with costs of agricultural production and conditions; the second part with factories; and the third part with beet sugar and statistical tables of all sugars. Detailed data are given for the 3 years, 1909-1911, inclusive. For the year and season of 1911-12 data are selected from 15 of the 23 parishes, which produce 97 per cent of the total cane tonnage of the State, and detailed costs are taken from the books and records of establishments operating 56 plantations and 23 factories. The plantation costs include for 1911 the cane tonnage of 49,923 acres, 29,092 acres in 1910, and 21,382 acres in 1909. The total cost in 1911 per acre harvested was \$69.90, in 1910 \$81.76, and in 1909 \$79.78.

In addition to direct-cost statistics, the report gives data relative to many conditions in Louisiana cane sugar production as, for example, facts relating to restorative crops, fertilizers, drainage, tenant systems, supply and efficiency of labor, contracts between grower and manufacturer, systems of delivery and transportation, process of manufacture, etc.

Cost accounting on farms, G. F. WARREN (*N. Y. Dept. Agr. Bul. 35, 1912, pp. 921-926*).—In addition to a brief discussion of the cost of production and cost accounting the author gives some results obtained in studies as to the cost of a number of factors entering into agricultural production in New York State.

On the well-managed farms hired labor was found to cost from 18 to 22 cts. per hour; horse labor from 12 to 13 cts. per hour; and machinery, including original cost, repairs, interest on capital, buildings to house it, etc., about

4 cts. per hour, making total cost for a man, team, and machinery for a 10-hour day about \$4.85. Observations are made as to other elements of cost which should be included in cost accounting.

Farm accounts, J. HUNTER (*Jour. Accountancy*, 15 (1913), No. 3, pp. 166-173).—This article discusses the importance of keeping farm accounts and submits illustrations showing simple bookkeeping devices which may be easily followed in keeping a record of financial transactions in any type of farming.

Work of the American commission respecting agricultural finance, organization, cooperation, and the betterment of rural conditions, D. U. FLETCHER (*U. S. Senate*, 63. Cong., 1. Sess., Doc. 177, 1913, pp. 15).—This is an address delivered to the house of governors at Colorado Springs, Colo., August 26, which describes at length the character and extent of the investigation of rural credits and other questions recently made in European countries by the American commission (*E. S. R.*, 28, p. 301).

State loans to farmers, W. M. DUFFUS (*Business America*, 14 (1913), No. 3, pp. 260-265).—This article discusses briefly the necessity for an adequate system of long-time farm mortgage loans, suggesting ways by which money for loans of this kind may be supplied to farmers, and giving special attention to the system of state loans as practiced by the New Zealand, Australian, and Philippine Governments and to the methods by which state aid is extended to settlers in New Brunswick and Nova Scotia.

The author points out that the New Zealand Government has granted loans amounting to £12,051,381, or about \$60,000,000, to 32,783 settlers since 1895. Of these loans 14,886 or 45 per cent have been repaid and only 33 failures had been noted up to 1912. Loans are made for terms of 20, 30, or 36½ years, according to the class of land taken as security. The rate of interest charged is but 5 per cent.

Attention is called to the fact that 8 American States are authorized by law to make loans to farmers, and that all of these have done so to a greater or less extent without loss. Some conclusions of the Wisconsin State Board of Public Affairs, which has been investigating the subject, are also noted.

Farm credit in a northwestern State, M. JACOBSTEIN (*Amer. Econ. Rev.*, 3 (1913), No. 3, pp. 598-605).—This article represents the results of an investigation as to the prevailing rate of interest paid by farmers in North Dakota and to what extent the rate is affected by local conditions. Reports were obtained from 125 representative banks, giving rates for 45 out of 50 counties in the State.

The average rate is shown to be 7.88 per cent on long-time loans. In the eastern tier, or most fertile and longest cultivated counties, it ranged from 6 to 7 per cent, rising gradually toward the western part of the State to 10 and 12 per cent. Reports sent to over 100 representative farmers in different parts of the State indicated a prevailing rate of 7.91 per cent.

The same banks reported the average rate of interest on short-time loans to be 10.75 per cent while the farmers reported it to be 11.07 per cent. More than 75 per cent of the banks reporting stated that the rate was higher for agricultural short-time loans than for commercial loans. That the farmers avail themselves more of book or store credit than short-time loans from banks is indicated by answers from 54 implement dealers, located in 35 counties, which show that only 13 per cent of the farmers pay cash for farm machinery.

Among the reasons assigned for the higher rate of interest are the following: (1) The demand for capital in a new and growing State is greater than can be met by the local supply, and outside capital can be attracted only by high rates of interest; (2) the speculative character of the farm mortgage, which

is due to the newness of the State and the instability of the population; (3) the single crop system of farming, a failure delaying or deferring payments at least 1 year; (4) legal restrictions placed on the loaning power of bank; and (5) injudicious loaning which leads to extravagance and to high interest rates to offset the risk involved.

How to operate a mortgage bank, G. WOODRUFF (*Business America*, 14 (1913), No. 2, pp. 161-164).—This article discusses and illustrates the plan of organization and method of operating a land mortgage bank, it being noted that practically any state bank in the United States authorized by law to loan money on mortgage security is already able to convert itself into a mortgage bank or to open a mortgage bank department. The following are some of the requirements suggested as necessary: (1) The bank should loan money exclusively on an amortization basis; (2) loans made on farm lands should not exceed 50 per cent of the value of the land and should be made for periods of 30 years, while such loans as are made on property other than farm land should run for a somewhat shorter period; (3) the borrower on any interest-paying date should be allowed to pay off the entire amount due on his loan; (4) the bank should obtain the capital with which to buy the mortgages by the issue of investment bonds; (5) each mortgage should be the first and a valid lien on certain specified real estate; (6) all mortgages on farm lands should contain provisions for proper soil conservation; and (7) the bank should acquire no real estate except to protect its interest in case any of the mortgages owned by it should be foreclosed. A number of other suggestions are given, also a table showing amounts paid as interest, principal, expenses, and profits semiannually for a 30-year period on a \$1,000 loan.

Farmers and the taxation of land values, J. FELS (*Agr. Econ.*, 46 (1913), No. 525, pp. 233, 234).—This article presents a brief discussion of the policy of taxing land values for the purpose of raising public revenues, holding that such a tax would not be paid by the user of the land, as held by some, but by the rent receiver.

The advantage claimed for such a system of taxation is in the forcing of owners who hold their land out of use to bring it into productive use or release it to others willing to do so. Owners all over the country would also be in keen competition with each other to secure tenants, which would insure a more equitable arrangement as to prices, rents and terms of tenure, and in contrast with the present system would encourage and stimulate industry and enterprise.

In justification of his contentions the author shows that a large number of municipalities in western Canada raise their local revenues entirely by taxation of land values and are pressing for an extension of the principle to provincial and federal revenues. He points out that in January last the United Farmers of Alberta, with a membership of 14,000, at their annual convention unanimously pledged themselves "in favor of the complete abolition of the customs tariff of Canada as soon as possible and the collection of the public revenues by a direct tax on land values."

Cooperation for better farming with county agriculturists, F. S. COOLEY (*Montana Sta. Circ.* 27, pp. 8).—This circular discusses the economic advantages of cooperation among farmers generally, and especially county cooperation in securing and maintaining a county agriculturist.

The farm bureau making good in Chautauqua County, N. Y., A. M. LOOMIS (*Tribune Farmer* [N. Y.], 12 (1913), No. 618, p. 2).—The farm bureau of Chautauqua County, N. Y., the work of which is described in this article, was established about a year ago. It is noted that special service has been rendered in

securing seed and fertilizing materials for farmers and in the organization of apple-growers' associations and cow-testing associations. Taking the county as a whole it is asserted that a 20 per cent saving in the cost of fertilizers has been effected this year through the efforts of the bureau. The work of the bureau relative to cow-testing associations is described at length.

Commercial and agricultural organizations of the United States (*U. S. Senate, 62. Cong., 3. Sess., Doc. 1109, 1913, pp. 125*).—This document gives the name, address, membership, income, etc., of the various agricultural and commercial organizations of the United States.

Cooperation among agriculturists in Holland, S. LISTOE (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 175, pp. 574, 575*).—According to this report there are 735 cooperative credit and loan banks in the Netherlands, 1,436 cooperative agricultural societies, about 700 cooperative creameries, 1,543 mutual live stock insurance societies, and about 100 cooperative societies for the disposal of fruit and vegetables. Only market gardeners and fruit growers can become members of the latter class. The method of selling is for the members to elect from their number a council which buys land, erects buildings, and sells at auction the produce raised by the members. Data are given for a period of years showing the success of the system.

A short survey of the Danish agriculture, H. HANSEN, V. MADSEN, ET AL. (*Copenhagen, 1913, pp. 64*).—This booklet was written by Danish agricultural experts and published by the Royal Danish Agricultural Society for the benefit of foreigners who visit Denmark with a view to studying her agricultural conditions. "It presents in a highly condensed form the most important information about agriculture, forestry, horticulture, and other branches of agricultural industries, and about the conditions under which these work."

AGRICULTURAL EDUCATION.

The sequence and development of courses in horticultural instruction, A. T. ERWIN (*Proc. Soc. Hort. Sci., 8 (1911), pp. 55-59*).—As an applied science the author believes that horticulture "should clearly have its foundation in the fundamental sciences, particularly botany, chemistry, zoology, and physics." Although theoretically this would imply its postponement till graduate work, it is believed to be possible to lay stress on the fundamental sciences during the first two years and yet introduce with them a limited amount of vocational work along the student's chosen line. Greater and earlier attention to physiological botany is also advocated.

The selection of the beginning course in horticulture must be made from two points of view, one that of the general agricultural student and the other that of the student specializing in horticulture. The author believes that the beginning course should be shaped out primarily for the general agricultural student. He suggests pomology as the introductory course, particularly the factors relating to the establishment of the orchard, and with the accompanying laboratory work largely along the line of systematic pomology. A special course should follow for the students specializing in horticulture along the line of field practice.

The sequence of horticultural courses will be affected somewhat by climatic conditions. Since the esthetic side of landscape gardening should be emphasized the work will be more fully appreciated by upper classmen, and the author believes that the subject might well be required in the senior year in all agricultural courses.

Class-room methods of teaching pomology, C. S. WILSON (*Proc. Soc. Hort. Sci.*, 8 (1911), pp. 55-55).—The subjects discussed in this paper are (1) the field of the subject, (2) the class-room methods of presentation, and (3) the character of instruction. A syllabus of courses at Cornell University is given.

In the research courses the student is assigned a topic for investigation. He prepares a bibliography, reviews the literature, collects and arranges the information, and writes up the subject in thesis form. At the seminary meetings the research problems are presented and discussed.

The class-room methods consist of lectures and in a few cases recitations, together with laboratory work. The author believes that with "more recitations and fewer lectures . . . the character of instruction would be higher."

It is customary to give preliminary and final examinations during the term and to supplement the lecture and laboratory work by assigning collateral reading. Problems to be worked out by the student are suggested. It is believed that the instruction now given in the different colleges lacks greatly in unity and that the question of teaching is a very important one.

Teaching pomological laboratory work, W. PADDOCK (*Proc. Soc. Hort. Sci.*, 8 (1911), pp. 60-66).—General complaint is made in this article as to the scarcity of information on teaching methods in pomology. The discussion is confined to the year's work in pomology at the Ohio State University. This is largely a laboratory course. The first 2-hour periods are given to a visit to the commission houses of the city, each student being provided with a syllabus and furnishing a description of the work. When the weather is unsuitable describing, identifying, and judging fruits is substituted.

The instruction in systematic pomology extends over a period of about 3 months, when the work of orchard management begins. Usually the first topic to be considered is a study of buds. This work is varied with inspections of the fruit plants themselves.

Four periods are devoted to practical work in pruning. At some time during the course several laboratory periods on propagation are given. Under spraying 4 or 5 laboratory periods are devoted to the making and applying of spraying materials. Two periods are given to the gas engine, and 1 each to the inspection and pruning of nursery stock, planting trees in an orchard, and frost protection.

One or more visits are made to the market districts of the city during the spring, and at least 1 trip to a well handled orchard, preferably during the spraying season. The students also prune neglected orchards.

The author states that this flexible outline fills in the year fully and apparently fits into the special conditions very well.

The agricultural college and rural economics, C. W. PUGSLEY (*Off. Yearbook Nabr. Farmers Cong.*, 1913, pp. 43-57).—In this address the author describes briefly the establishment and work of the agricultural colleges and experiment stations, showing the possibility and necessity of research work along economic lines and the introduction of instruction courses in rural economics.

Outlines for secondary courses in agriculture (*Minn. [Dept. Pub. Instr.] Bul.* 38, 1912, pp. 93).—Agricultural conditions vary so much in Minnesota that, instead of recommending a course of study for general adoption by the schools receiving state aid for industrial work, the state superintendent of public instruction appointed a committee of 7 members to prepare suggestive courses of study in agriculture. As a result of this committee's work the state department of public instruction has issued in this bulletin form several standard courses from which each school may choose or fit together a course adapted to local conditions.

Rural school agriculture, H. L. KENT (*Agr. Ed. [Kans. Agr. Col.]*, 5 (1912), Nos. 2, pp. 4; 4, pp. 4; 7, pp. 4; 8, pp. 4; 5 (1913), Nos. 9, pp. 4; 12, pp. 4; 14, pp. 4).—These monthly outlines for teachers are based on the following principles: (1) The work in agriculture should follow the order of the seasons rather than the order of the textbook; (2) the teacher should emphasize the study of things of special importance to that particular locality; (3) the class work should make use of materials as largely as possible and this subject should be a study of things rather than of books; (4) recitation periods should be longer, even though there must be fewer of them a week; and (5) the teacher must plan the work for at least a week in advance and provide materials beforehand.

Instruction in home economics and agriculture for young girls, A. CARRÉ (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 16, pp. 494-504).—This article discusses the necessity of professional instruction for the future farm woman, the rational organization of instruction in home economics and agriculture, higher agricultural and home economics instruction at Grignon, fixed and itinerant schools of agriculture and home economics, and the advantages and deficiencies of home economics schools.

Good Roads Arbor Day, compiled by SUSAN B. Sipe (*U. S. Bur. Ed. Bul.* 1913, No. 26, pp. 29, pls. 9).—The object of this bulletin is to call the attention of school children to the importance of good roads and to the various means of making travel over them more comfortable and attractive. It contains a brief statement as to the history of road building in this and other countries, the custom of planting trees on the roadside, and other material that can be used in the observance of Good Roads Arbor Day.

The value of agricultural club work in New England, O. A. MORTON (*Jour. Ed. [Boston]*, 78 (1913), No. 3, pp. 74-76).—Among the questions discussed in this article are (1) how does the country school work of the past compare with that of the present; (2) who is to be held responsible largely for the re-direction of the rural schools into more practical community activities; and (3) in what ways may horticultural, agricultural, and domestic science club work become a real factor in the educational, social, and industrial betterment of the community in which it is located?

It is pointed out that the superintendents of schools and teachers in over 250 cities and towns in Massachusetts have organized one or more units of work and that over 7 tons of seed and literature have been sent this year from the Massachusetts Agricultural College to 19,687 members of local clubs. More than 56,000 boys and girls cultivated home and school gardens and larger areas this year under the direction of their teachers and superintendents. Over \$7,000 was available for local and state premiums. The author believes that agricultural club work is one of the most promising, profitable, and helpful lines of educational work now open to educators.

Elementary agriculture in the rural schools of Missouri, R. H. EMBERSON (*Wallaces' Farmer*, 38 (1913), No. 24, p. 940).—According to this article, 30,938 pupils in 103 counties reporting studied elementary agriculture in the rural schools of Missouri during the school year of 1912-13. The work consists, among other things, in the preparation of notebooks containing reports of the experiments and other tests and compositions on special agricultural products of the school district. Many of the rural schools also hold corn judging contests and make practical applications of grafting, pruning, spraying, and learning to judge live stock. Some of the schools are making the school garden a part of the daily work. It is the verdict of teachers that this work brings new interest and enthusiasm into the whole program of the school.

MISCELLANEOUS.

Report of the director for the year ending June 30, 1912, F. B. MUMFORD (*Missouri Sta. Bul. 111, pp. 211-255*).—This contains the organization list, a report of the director on the work and publications of the Missouri Station, including reports of departments, and a financial statement for the fiscal year ended June 30, 1912.

Nineteenth Annual Report of Montana Station, 1912 (*Montana Sta. Rpt. 1912, pp. 69-92*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1912, a report of the director on the work and publications of the station, and a meteorological summary abstracted on page 616 of this issue.

Annual Report of Porto Rico Station, 1912 (*Porto Rico Sta. Rpt. 1912, pp. 44, pls. 6*).—This contains the organization list, a summary by the special agent in charge as to the investigations conducted at the station during the year, and separate reports by the physiologist, chemist, horticulturist, assistant horticulturist, plant pathologist, entomologist, and animal husbandman. The experimental work reported is for the most part abstracted elsewhere in this issue.

Twenty-fourth Annual Report of Tennessee Station, 1911 (*Tennessee Sta. Rpt. 1911, pp. 165-190, figs. 9*).—This contains the organization list, reports of the director and the various departments, the experimental features of which are for the most part abstracted elsewhere in this issue, and a financial statement for the fiscal year ended June 30, 1911.

Twenty-fifth Annual Report of Tennessee Station, 1912 (*Tennessee Sta. Rpt. 1912, pp. 45-72, figs. 7*).—This contains data corresponding to the above for the fiscal year ended June 30, 1912, and in addition a list of the bulletins and press bulletins available for distribution. The experimental data reported are for the most part abstracted elsewhere in this issue.

Twenty-fifth Annual Report of Texas Station, 1912 (*Texas Sta. Rpt. 1912, pp. 83, figs. 14*).—This contains the organization list, a list of the publications available for distribution, a report of the director on the work of the station and the various substations, including brief notes as to variety, cultural, fertilizer, and miscellaneous tests under way, and a financial statement for the federal funds for the fiscal year ended June 30, 1912, for the state funds for the fiscal year ended September 30, 1912, and for the D. B. Clarkson fund for the fiscal year ended December 31, 1912.

Annual Reports of Virginia Station, 1911 and 1912 (*Virginia Sta. Rpts. 1911-12, pp. 259, figs. 53*).—This contains the organization list, a report of the director as to the organization, publications, finances, work, and other data pertaining to the station, including a discussion of its relations with the Virginia Truck Station, a financial statement for the fiscal year ended June 30, 1912, departmental reports, and numerous special articles abstracted elsewhere in this issue.

Fergus County substation: Report on the work and plans, J. M. STEPHENS (*Montana Sta. Bul. 93, pp. 32, figs. 10*).—This contains a report as to the work under way at the Fergus County substation, results with field crops being abstracted on page 630 of this issue.

Experiment Station Work, LXXVI (*U. S. Dept. Agr., Farmers' Bul. 549, pp. 24, figs. 15*).—This number contains articles on the following subjects: The farm water supply, storage of potatoes, the meadow lark from the farmer's standpoint, egg-laying contests and breeding for egg production, sprouting oats for poultry, carbolic acid for contagious abortion in cattle, and cooling cream without ice.

NOTES.

Alabama College and Station.—Recent appointments include G. S. Templeton of the Texas College as head of the department of animal industry; E. S. Gorton, a 1913 graduate of the Iowa College, as assistant professor of animal industry, vice L. W. Summers resigned to become associate professor of animal husbandry and animal husbandman in the Virginia College and Station; A. R. Gissendanner and J. A. McLeod as assistants in animal industry; and H. B. Tisdale as assistant in agriculture.

Arizona University and Station.—J. C. T. Uphof has been appointed instructor in plant breeding and assistant plant breeder to succeed D. F. Jones, who has been appointed instructor in horticulture in Syracuse University.

Arkansas University and Station.—Lynn W. Osborn has been appointed instructor in agronomy and assistant agronomist.

Connecticut College and Storrs Station.—The entering class numbered 70, the largest in the history of the institution.

The third international egg-laying contest under the sole management of the college and station began November 1 with eight entries.

E. B. Fitts, instructor in dairying in the college, and assistant in dairy husbandry in the station, has resigned to engage in extension work in dairy and animal husbandry at the Oregon College and has been succeeded by H. E. Judkins. B. G. Southwick has been appointed assistant agronomist.

Delaware College.—W. C. Pelton, assistant in horticulture, has been appointed assistant in market gardening at the New Jersey Stations in connection with extension work.

Georgia College and Station.—Recent appointments in the college include the following: O. T. Goodwin, as instructor in animal husbandry, vice H. B. Carpenter; R. E. Blackburn, as tutor in horticulture, vice C. M. Kiger; M. W. Lowry, as adjunct professor of soil chemistry, vice R. S. Hollingshead; and G. E. Downing, to take charge of the pig club work in Georgia in cooperation with this Department, and with headquarters at the college. Miss Mary E. Cresswell, in charge of girls' canning club work in the State, resigned October 1 to supervise this work for the South as a whole and with headquarters in Washington, D. C.

At the station, C. A. McLendon, for the past five years botanist and plant pathologist and in charge of plant breeding investigations, resigned October 1 to engage in commercial work in Columbia, S. C., and was succeeded by B. B. Higgins (Ph. D., Cornell, 1913). C. A. Wells has been appointed resident chemist.

The station has just completed two barns of solid concrete at a total cost of about \$8,000. One is to be used as a horse barn and the other exclusively for nutrition experiments with cattle.

Illinois University and Station.—The new armory now under construction is to be further enlarged by the addition of two 30-foot bays, making the entire structure 400 by 200 feet and providing a seating capacity of 8,000 on the floor and ultimately 3,000 additional by means of galleries. The building will be utilized for exhibition purposes, conventions, farmers' short courses, etc.

The live stock pavilion is nearing completion. It is a fire-proof structure of steel, brick, concrete, and terra-cotta with a ringside seating capacity of from 1,800 to 2,000, and will cost about \$100,000.

An estate of 320 acres has been purchased at a cost of \$256,000 for enlarging and developing the horticultural work, including forestry. A new group of floricultural buildings is under construction, which it is believed will constitute one of the most complete plants for instruction and research in the world. It includes a range of eight greenhouses, a storage house, a corridor house, and a service building. The greenhouses cover an area of about 28,000 square feet and may readily be increased to 65,000 square feet. Three of the greenhouses are to be used for instruction and four for research. The service building is a two story and basement structure of brick and stucco, 37 by 95 feet.

Dr. C. G. Hopkins has been granted a year's leave of absence to engage in agricultural development work in the South under the auspices of the Southern Settlement and Development Organization. Albert W. Jamison has been appointed associate in agricultural extension and Joseph H. Checkley assistant in that subject.

Purdue University and Station.—A rural life conference was held at the university October 13-17, including meetings of the various county agents and farmers' institute workers.

Recent appointments include E. H. Johnson as instructor in animal husbandry, H. A. Noyes, a recent recipient of the M. S. degree from the Massachusetts College, as research assistant in horticultural chemistry, J. W. Schwab as assistant in extension work in animal husbandry, Fred D. Fromme and H. C. Travelbee as assistants in botany, and C. B. Durham as assistant in horticulture.

Iowa College and Station.—According to *Wallaces' Farmer* a course of six lectures is to be given by members of the extension department at the theological seminary of Drake University upon farm crops, soils and farm management, animal husbandry, dairying, poultry, horticulture, and rural landscape gardening.

W. C. Coover has been made head of the department of chemistry, vice A. A. Bennett resigned. Other appointments include Harry C. Hetzel as instructor in horticulture, A. W. Griffin as assistant chief in agricultural engineering, vice M. L. King resigned, George S. Tilley as assistant chief in dairy investigations, A. T. Erwin as associate professor of truck crops and landscape gardening, Russell Dunn as assistant chief in animal husbandry, R. S. Potter, Ph. D., as assistant in soil chemistry, M. E. Sar as assistant in soils, and Elmer Scales as assistant in farm crops. W. E. Ruth has resigned as assistant in chemistry and C. R. Forest as superintendent of field experiments.

Kansas College and Station.—The college observed its fiftieth anniversary October 28-30. The speakers at the elaborate exercises included Governor Hodges, Hon. G. T. Helvering, Chancellor Strong of the University of Kansas, Dean Davenport of the University of Illinois, President Stone of Purdue University, Dr. A. C. True of this Office, David G. Fairchild of this Department, and many others. A feature was the student parade illustrative of the various activities of the institution.

The new live stock barns are nearing completion. There will be two wings 50 by 80 feet and one 50 by 60 feet for horses and cattle. A nutrition barn 32 by 92 feet, and a hog barn 22 by 48 feet, have been completed.

The dairy department is starting a series of experiments at the Fort Hays substation to determine the most profitable of the following practices: (1) To feed the bull calves on skim milk the first year and then keep them on grass the following summer before marketing; (2) to feed them whole milk and

market them as veal at two months of age; and (3) to use the skim milk for pigs instead of calves, disposing of the calves at once.

E. A. Popence, head of the department of entomology from 1879 to 1897 and 1899 to 1907, and in the early days professor of several related subjects, died recently at his home in Shawnee County following a sickness of over a year. Professor Popence was born in Ohio in 1853 and was graduated from Washburn College in 1876, subsequently receiving the master's degree from the same institution. He was a life member of the American Pomological Society, and for several years a vice-president of the American Forestry Association, and secretary of the American Horticultural Society. He had published several bulletins on horticultural and entomological subjects and built up in large part the biological museum and entomological collections of the college.

E. B. McCormick, dean of mechanic arts, has resigned to become the director of the testing laboratories in the Office of Public Roads of this Department. Among other appointments are the following: **C. Salmon**, of this Department, as assistant professor of farm crops; **P. S. Welch** as assistant entomologist in charge of staple crop insect investigations, vice **Dr. M. C. Tanquary**, who is accompanying the Crocker Land Expedition; **J. E. Ackert** as station parasitologist, vice **J. W. Scott**, whose resignation has been previously noted; **Harry B. Yocom** as zoologist in connection with investigations of injurious mammals; **J. P. Poole** as assistant in plant breeding, vice **D. A. Rose**, who has become pathologist at the Missouri Fruit Station; **L. E. Melchers** as assistant in plant pathology; **D. W. Wells** as instructor in botany; **G. A. Gilbert** of the Colorado College as instructor in dairy husbandry and assistant dairy husbandman, vice **A. W. Rudnick**, who has become assistant professor in dairying at the Iowa College; and **Miss Grace Glasgow** as assistant professor of bacteriology. **Duncan Stuart**, assistant in dairy field investigations and assistant to the director, has accepted a position with this Department.

Maine Station.—An appropriation of \$10,000, made by the last legislature for acquiring a farm in Aroostook County, has been utilized in the purchase of an undivided half of a farm at Presque Isle. This farm contains 280 acres and a modern barn 50 by 100 feet, as well as considerable standing timber which will be available for the erection of a residence. The purchase price for the remainder of the property and its equipment is to be advanced by about 35 citizens of the locality, with a view to its subsequent acquirement by the State, the station meanwhile exercising control of the entire farm.

Missouri University and Station.—Among recent appointments are the following: **Frederick Dunlap** as head of the department of forestry, **L. S. Palmer, Ph. D.**, as assistant professor of dairy chemistry and assistant dairy chemist; and as assistants **Elmer H. Hughes** in animal husbandry, **F. L. Bentley** in agronomy, **C. C. Wiggins** in horticulture, **R. S. Besse** in farm management, **C. A. Webster** in poultry husbandry, **E. R. Spence** in veterinary science, **T. J. Talbert** in entomology, and **C. E. Deardorff**, **W. I. Watkins**, and **E. W. Knobel** in the soil survey.

Missouri Fruit Station.—**M. P. Somes**, assistant entomologist in the South Carolina Station, has been appointed entomologist and has entered upon his duties.

New Hampshire College and Station.—An exhibit by the station of hybrid melons, produced in connection with its breeding work, received the rarely conferred silver medal of the Massachusetts Horticultural Society at its meeting in Boston September 15. **P. V. Mitchell** has been appointed in charge of the new poultry department.

Cornell University.—**Ralph W. Curtis** of the Arnold Arboretum has been appointed assistant professor of landscape art. **W. H. Chandler**, assistant pro-

fessor of horticulture and assistant horticulturist at the Missouri University and Station, has been appointed professor of pomology, and L. Wayne Arny, associate editor of the *Pennsylvania Farmer*, instructor in pomology.

North Dakota College and Station.—President J. H. Worst resigned as director of the station October 16 to take effect January 1, 1914, and will be succeeded by Thomas P. Cooper.

Ohio State University and Station.—Recent appointments at the university include H. C. Ramsower as professor of rural engineering, Norman W. Scherer of the Forest Service as associate professor of forestry, V. C. Smith as assistant to Dean Price, and J. R. Wiley (Purdue 1913) as instructor in animal husbandry.

At the station Charles McIntire, agent in charge of the county experiment farms, has resigned to accept an appointment from the State Board of Administration as general manager of the 18 farms attached to the prisons and asylums of the State. C. A. Gearhart has been appointed assistant agronomist and M. C. Thomas county agricultural agent for Butler County.

Rhode Island Station.—Leonard A. Maynard, assistant chemist, has resigned to pursue graduate study at Cornell University.

South Dakota College and Station.—H. S. Coe has been appointed instructor in plant pathology in the college and consulting botanist in the station. E. D. Stivers has been appointed professor of secondary education and director of correspondence courses, vice A. A. Brigham resigned.

Tennessee University and Station.—A series of 14 short courses, of one week each, to be held at points distributed throughout the State, began October 13, and will continue until January 17. The railroads cooperate with the college of agriculture by giving transportation to the instructors and to the car of live stock and demonstration material that goes from place to place, and the expenses are borne largely by the farmers of the respective communities visited.

Russell G. Briggs has been appointed assistant in horticulture in the station.

Vermont University.—F. B. Jenks, of the United States Bureau of Education, has been appointed professor of agricultural education. Thomas Bradlee has been appointed in charge of agricultural extension.

Wisconsin University and Station.—Dr. F. W. Woll, professor of agricultural chemistry and in charge of the feed and fertilizer control and dairy tests of the station, has resigned to take charge of research work in animal nutrition at the California University and Station with headquarters at Davis. Dr. Orren Lloyd-Jones, assistant in experimental breeding, has accepted a position with the Iowa College as assistant professor of animal husbandry in charge of work in genetics, and has been succeeded by Frank J. Kelley. C. A. Ocock, assistant professor of agricultural engineering and agricultural engineer, has resigned to engage in commercial work. Conrad Hoffman has been succeeded as assistant agricultural bacteriologist by Dr. E. B. Fred of the Virginia Station. George F. Potter, a 1913 graduate of the university, has been appointed assistant in horticulture, and J. J. Garland assistant in agronomy.

ADDITIONAL COPIES of this publication may be procured from the SUPERINTENDENT OF DOCUMENTS, Government Printing Office, Washington, D. C., at 15 cents per copy.

Subscription price, per volume of 9 numbers, \$1

Hogg p 626

EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, PH. D., *Assistant Director*.
Assistant Editor: H. L. KNIGHT.

EDITORIAL DEPARTMENTS.

Agricultural Chemistry and Agrotechny—L. W. FETZER, Ph. D., M. D.
Meteorology, Soils, and Fertilizers { W. H. BEAL.
R. W. TRULLINGER.
Agricultural Botany, Bacteriology, and Vegetable Pathology { W. H. EVANS, Ph. D.
W. E. BOYD.
Field Crops { J. I. SCHULTE.
G. M. TUCKER, Ph. D.
Horticulture and Forestry—E. J. GLASSON.
Foods and Human Nutrition { C. F. LANGWORTHY, Ph. D., D. Sc.
H. L. LANG.
Zootechny, Dairying and Dairy Farming—H. WEBSTER.
Economic Zoology and Entomology—W. A. HOOKER, D. V. M.
Veterinary Medicine { W. A. HOOKER.
L. W. FETZER.
Rural Engineering—R. W. TRULLINGER.
Rural Economics—B. B. HARE.
Agricultural Education—C. H. LANE.
Indexes—M. D. MOORE.

CONTENTS OF VOL. XXIX, NO. 8.

Editorial notes:	Page.
Research, experiment, and demonstration	701
The essentials of research.	702
Lines of demarcation between experiment and demonstration.	707
Recent work in agricultural science.....	711
Notes.....	794

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Fruit juices, Thompson and Whittier.....	711
Soy-bean oil, Thompson and Morgan.....	712
Lactic acid in corn silage, Dox and Neidig.....	712
Importance of hydrocyanic acid and glucosids in plant chemistry, Jorissen.....	713
The action of manganous sulphate on castor bean lipase, Falk and Hamlin.....	713
Analysis of the ash of the castor bean, Hamlin.....	714
Symbiosis by various types of yeast, Vandevelde and Bosmans.....	714
Influence of temperature on the processes produced by yeast, Van Amstel....	714
Alcoholic fermentation, Harden.....	714
Constitution of proteins, with special reference to Reichard's reaction, Rottke..	715
The heat coagulation and solution of albumin, Gayda.....	715
Specific rotation of fructose, Tollens.....	715
Quantitative determination of saccharose in foods and condiments, Jolles.....	715
Influence of peptone on determination of sugar by Fehling's solution, Bernardi..	716
Quantitative determination of glucose by Bertrand's method, Rosenblatt.....	716
The polarimetric determination of starch, Lintner.....	716

	Page.
Colorimetric determination of alcohols in the presence of ketones, Agulhon....	716
The detection of formic acid in meat, Kapin.....	716
The detection of formic acid in sirups, Kreis.....	717
Biochemic reactions and the bacterial count of milk, Campbell.....	717
Casein media adapted to the bacterial examination of milk, Ayers.....	718
A proposed modification of the official method of determining humus, Smith..	718
Method for preparing neutral ammonium citrate solution, Patten and Marti..	718
Distillation and composition of turpentine oil from the chir resin, Singh.....	719
Note on the clarification of Indian rosin, Singh.....	719
French bibliography concerning sugar and the sugar industry, Sculier.....	719

METEOROLOGY—WATER.

Climatic areas of the United States as related to plant growth, Livingston....	719
Volcanic dust and other factors in production of climatic changes, Humphreys.	720
Volcanoes and climate, Abbot and Fowle.....	720
Do volcanic explosions affect our climate? Abbot.....	721
Evaporation as influenced by the haze of 1912, Briggs and Belz.....	721
Bulletin of the Mount Weather Observatory.....	721
Monthly Weather Review.....	721
Meteorological reports, Georgeson.....	722
Meteorological observations at Massachusetts Station, Ostrander and Dexter..	722
Meteorological record.....	722
Ohio weather in 1911, Smith and Patton.....	722
Water resources of coastal plain of North Carolina, Stephenson and Johnson...	722
Water.....	722
Farm water supplies, with special reference to dairy farms, Prescott.....	722

SOILS—FERTILIZERS.

Amino acids and acid amids as sources of ammonia in soils, Jodidi et al.....	723
On the probable value of <i>Bacillus coli</i> of "slime" formation in soils, Revis....	723
Relation of nonavailable water of soil to hygroscopic coefficient, Alway.....	724
Investigations on moisture and soil types in Sulphur Spring Valley, Clothier..	725
[Effect of ashes from Mt. Katmai on Alaskan soil], Georgeson.....	726
Soil fertility, Neal.....	726
La Salle County soils, Hopkins et al.....	727
The selection of soils in the Tropics, Wohltmann.....	727
Malayan soils, Barrowcliff.....	727
Analyses of soils, Aston.....	728
A report of progress in soil fertility investigations, Hutton.....	728
Increasing crop yields in Ohio.....	728
Alpine fertilizer experiments in Carinthia, 1910-1912, Svoboda.....	728
Studies in Japanese agriculture.—I, Fertilizers, Struthers.....	729
Importation of fertilizers, Aston.....	729
Phosphates: Their importance to New Zealand farmers, Aston.....	730
Progress in the fixation of atmospheric nitrogen, Pinkerton.....	730
The partial sterilization of the soil by means of caustic lime, Hutchinson.....	730
The lime-magnesia ratio in agriculture, Larue.....	730
Tests of radio-active substances, Berthault, Brétagneire, and Berthault.....	731
Night soil.....	731
The use of commercial fertilizers in pond culture, Foitik.....	731
Pond fertilizing experiments, Neresheimer.....	731
Analyses of commercial fertilizers, Stackhouse, Brackett et al.....	731
Commercial fertilizers, Hills et al.....	731
Commercial fertilizers: Inspection, 1912, Hite and Kunst.....	731

AGRICULTURAL BOTANY.

Studies on temperatures in relation to seeds and seedlings of wheat, Müller....	731
On various methods for determining osmotic pressures, Halket.....	731
The nutrition of some of the higher plants in sterile cultures, Shulov.....	732
The assimilation of nutriment by yeast cells, Rubner.....	732
Penetration of different forms of nitrogen into plants; adsorption, Chouchak...	732
The absorption of different forms of nitrogen by plants, Chouchak.....	732

	Page.
Nitrogen fixation and nutrition of <i>Bacillus radiculicola</i> , Herke.....	733
Cross inoculation of root tubercle bacteria on Leguminosæ, Ewart and Thomson.....	733
The bacteria of Nebraska soil, Putnam.....	733
The action of acids and acid salts on <i>Aspergillus niger</i> , Kiesel.....	734
The resistance of <i>Penicillium crustaceum</i> to toxic substances, Le Renard.....	734

FIELD CROPS.

The technique of field experiments, Mortensen.....	734
Summary of [field crops experiments in Alaska], Georgeson.....	735
Report of [field crops] work at the Fairbanks Station, Neal.....	735
Report of [field crops] work at the Rampart Station, Gasser.....	735
Dry farming in the arid Southwest, Clothier.....	735
[Field crop experiments].....	736
[Field crop experiments], Taylor.....	736
Report of the department of agriculture, Punjab, for 1911-12, Gibson et al.....	736
Report on agricultural stations in Central Provinces and Berar, Plymen et al.....	736
Agricultural surveys, Yamethin district, McKerral.....	736
Concerning the Vermont hay crop, Hills, Jones, and Williamson.....	736
Report of work on alfalfa at Holly Springs branch experiment station, Ames.....	736
Cooperative manurial experiments on lucern, Reinecke.....	737
Broom corn culture, McCall.....	737
Methods of corn breeding, Hayes.....	737
Maize experiments at the experimental farm Potchefstroom, Bell.....	737
Manurial experiments on maize, 1911-12, Vipond.....	737
Distance for planting maize, Burt-Davy.....	738
Experiments in corn cultivation, Dammann.....	738
A method of improving the quality of cotton seed, Mehta and Gokhale.....	738
Cotton experiments in the Cape Province, Van Ryneveld.....	738
The story of cotton, Brooks.....	738
Inheritance of morphological characters of <i>Hordeum distichum nutans</i> , Fruwirth.....	738
Kafir as a grain crop, Ball and Rothgeb.....	738
Report on oat experiments.....	738
Spontaneous omission of the color factor in oats, Nilsson-Ehle.....	739
Place-effect influence on seed potatoes, Stuart.....	739
Cultural experiments with dried sugar beet seed in Hungary, Janosi.....	739
Annual report of the bureau of sugar experiment stations, Easterby.....	739
The sugar industry of Natal, Sawer.....	739
Notes on the germination of tobacco seed, Goodspeed.....	739
Biological point of view in the examination of seeds, Schaffnit.....	740
Germinative energy of seeds based on the mean time of germination, D'Ippolito.....	740
Effect of hot water and mechanical treatment on germination, Dodge.....	740
Seed analyses, Helyar.....	741
Results of seed tests for 1912, Taylor.....	741
Identification of <i>Agropyron repens</i> , <i>A. smithii</i> , and <i>A. tenerum</i> , Sarvis.....	741
Concerning certain pasture weeds, Gilbert.....	741
Moss as a pasture weed, Tracy.....	741
The ensiling of weeds, Washburn.....	741

HORTICULTURE.

The relation of light to greenhouse culture, Stone.....	741
[Horticultural investigations in Alaska], Georgeson et al.....	742
Report on vegetable and flower gardens in southeastern Alaska, Tracy.....	743
Pop corn for the market, Hartley and Willier.....	743
Pop corn for the home, Hartley and Willier.....	743
Cultural studies on the Montreal market muskmelon, Stuart.....	743
Potato culture in West Virginia, Dacy.....	744
Tomatoes for the canning factory, McCue and Pelton.....	744
Exhibiting fruit and vegetables, Winslow.....	745
[Fruit growing, cold storage, etc.], Moody.....	745
Variety adaptation, Thornber.....	745
The rejuvenation of old orchards, Alderman.....	745
Commercial fertilizers for strawberries, Chandler.....	745
Lime cultivation in the West Indies, Watts et al.....	745
Cacao: Manuring and shading.....	746

	Page.
The cashew (<i>Anacardium occidentale</i>), Granato.....	746
Manurial experiments on coconuts, De Verteuil.....	746
The inspection, certification, and transportation of nursery stock, Atwood....	746

FORESTRY.

Economic botany of Alabama.—I, Geographical report on forests, Harper.....	746
The fifth annual report of forest conditions in Ohio.....	746
1888 to 1913, 25 years of state and private forestry in Prussia, Semper.....	746
A review of the Saxony state forests for the year 1911, Vogel.....	746
Methods of identification of Philippine woods, Schneider.....	747
The trees of Great Britain and Ireland, Elwes and Henry.....	747
Yield investigations in oak high forests, Wimmenauer.....	747
Investigations on the value accretion of pine and spruce, Schwappach.....	747
Plantation rubber in Hawaii, Anderson.....	747
Effect of nitrate of soda and salt peter on the flow of Ceara latex, Anstead....	748
Castilla rubber in Dominica, Jones and Jones.....	748

DISEASES OF PLANTS.

Report of the department of botany, Butler.....	748
Work connected with insect and fungus pests and their control, Watts.....	748
[Plant diseases in Jamaica, 1913], Martinez.....	749
Mycological work in Southern Nigeria, Farquharson.....	749
The unattached aecial forms of plant rusts in North America, Johnson.....	749
Uredinales on Carex in North America, Arthur.....	750
Prevalence and prevention of stinking smut in Indiana, Orton.....	750
Late blight of barley, Bakke.....	750
Prevention of bunt in wheat.—Experiments with fungicides, Reynolds.....	750
A new grass parasite, Masee.....	751
Cotton anthracnose and how to control it, Gilbert.....	751
A typical case of curly leaf of cotton in the greenhouse, Thiele.....	751
Diseases of ginseng caused by Sclerotinias, Osner.....	751
Sugar cane diseases, Chavanne.....	751
[Lime treatments of soil for <i>Plasmodiophora brassicae</i>], Gilchrist.....	752
The New York apple tree canker, Hesler.....	752
A new parasite on <i>Polystigma rubrum</i> , Bondartsev.....	752
A conidia-bearing species of <i>Septobasidium</i> , Patouillard.....	752
The acid spotting of morning glories by city rain, Harshberger.....	752
Diseases of the violet, Reddick.....	753
The chestnut bark disease, Stoddard and Moss.....	753
The discovery of the chestnut bark disease in China, Fairchild.....	753
The chestnut blight parasite from China, Shear and Stevens.....	753
Recent work on the chestnut blight, Rocky.....	753
Report of Pennsylvania Chestnut Tree Blight Commission, 1912, Sargent et al.....	753
Pathological investigations, Heald and Anderson.....	753
Report of the physiologist, Rumbold.....	754
Birds as carriers of chestnut blight fungus, Heald and Studhalter.....	754
Some problems in the treatment of diseased chestnut trees, Pierce.....	755

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Life zones and crop zones of New Mexico, Bailey.....	755
The natural history of the nine-banded armadillo of Texas, Newman.....	755
The rats of Providence and their parasites, Robinson.....	755
Observations on the bionomics of fleas and rats in Java, Swellengrebel.....	756
Leprosy-like disease in rats, Tidswell and Cleland.....	756
Examination of contents of stomachs and crops of Australian birds, Cleland....	756
Annual report of the division of entomology for 1911, Lounsbury.....	756
Notes on insect pests in Antigua, Ballou.....	756
The insect pests of cotton in Burma, Shroff.....	756
Sugar cane in British Guiana, Moore.....	756
The tobacco petobacco in Southern Rhodesia, Jack.....	756
The insect enemies of the pear, Picard.....	756
The role of insects to disease in man in Australia, Cleland.....	756
Insects: A possible etiologic factor in pellagra, Jennings and King.....	756

	Page.
The life history of the sheep tick (<i>Melophagus ovinus</i>), Swingle.....	756
A list of Mallophaga found on animals in Australia, Johnston and Harrison....	757
Grasshoppers, Houser.....	757
<i>Coccobacillus erausquinii</i> n. sp., parasitic on <i>Romalea miles</i> , Cullen and Maggio..	757
The spruce aphid, Henry.....	757
A coccid injuring tobacco, Leonardi.....	757
The oyster-shell scale (<i>Lepidosaphes ulmi</i>), Sherman, jr.....	758
[Parasites of the San José scale in Pennsylvania], Surface.....	758
[Parasites of the San José scale], Howard.....	758
Action of mineral and other compounds, Maxwell-Lefroy and Finlow.....	758
The wattle bagworm (<i>Chalioides junodi</i>), Fuller.....	758
Two Microlepidoptera injurious to chestnut, Busck.....	758
A microlepidopterous enemy of the vine (<i>Cacæcia costana</i>), Picard.....	758
Insects-injurious to papaw apples, Jarvis.....	759
Injury to maple seed by <i>Nepticula sericopeza</i> , Trägårdh.....	759
The caraway moth (<i>Schistodepressaria nervosa</i>), Kleine.....	759
Surface caterpillar on tal lands, Woodhouse and Dutt.....	759
Malaria: Cause and control, Herms.....	759
<i>Coccidiascus legeri</i> n. g. and n. sp., a parasite of <i>Drosophila funebris</i> , Chatton....	759
Control of the orange maggot (<i>Trypeta ludens</i>), Crawford.....	759
Biology and morphology of some dipterous parasites of the nun moth, Tölg....	760
Other African species of <i>Ceratitis</i> , Bezzi.....	760
The mouth parts and sucking apparatus of the blood-sucking Diptera, Cragg....	760
The bionomics of <i>Stomoxys calcitrans</i> ; a preliminary account, Mitzmain.....	760
Investigations on <i>Stomoxys calcitrans</i> and coprophagous flies, Portchinsky.....	760
Transmission of micro-organisms by native flies, Schuberg and Böing.....	760
Warble flies: Observations on the life history of <i>Hypoderma bovis</i> , Gläser.....	761
Warble flies: The egg and oviposition of <i>Hypoderma bovis</i> , Gläser.....	761
<i>Æstrus ovis</i> , its biology and relation to man, Portchinsky.....	761
The kangaroo botfly (<i>Æstrus macropi</i> n. sp.), Froggatt.....	761
Darkling beetle grubs injurious to tobacco, Jack.....	761
Flea beetles and their control, Gibson.....	761
Borers in native timber, Jack.....	761
A new weevil enemy of the potato tuber, Sasser and Pierce.....	761
The food plant of <i>Cleonus calandroides</i> , Ely.....	761
The honey bee, Wright.....	761
Further report on the Isle of Wight bee disease.....	761
The influence of temperature and moisture in fumigation, Schoene.....	762
Studies on <i>Herpetomonas</i> , <i>Crithidia</i> , and <i>Rhynchoidomonas</i> , Patton.....	762
Color standards and color nomenclature, Ridgway.....	762

FOODS—HUMAN NUTRITION.

Influence of vegetables greened with copper salts on health, Remsen et al.....	762
Beef meal.....	765
Nutritive value of some foreign fish imported into France, Hollande.....	765
The decomposition and preservation of eggs, Kossovicz.....	765
Flour—the relationship of composition to bread-making value, Shutt.....	765
Diastase in bread making, Galli and Ceradini.....	765
Maple sugar, McGill.....	766
Maple sirup, McGill.....	766
Brandy.....	766
[Food and drug analyses], Rose and Henry.....	766
[Inspection of foods, dairy products, and feeding stuffs], Saunders et al.....	766
Composition of food materials, Langworthy.....	766
The ideal home cook book, Davenport.....	766
Cost of living of the working classes of the United Kingdom in 1912, McLeod....	766
Housing conditions and diet of high school pupils at Vevay, Schweitzer.....	767
Principles of human physiology, Starling.....	767
Water of imbibition of the tissues, Mayer and Schaeffer.....	767
Feeding experiments with mice, Wheeler.....	767
Residual nitrogen of the blood and absorption of nitrogenous food, Delaunay....	767
Residual nitrogen of the blood and absorption of amino acids, Delaunay.....	768
Fat absorption.—II, Absorption of fat-like substances other than fats, Bloor....	768
Pathological changes in pellagra and the disease in lower animals, Nicholls....	768
Metabolism during mental work.....	768

ANIMAL PRODUCTION.

	Page.
Silage.—The stack system, Dibble.	768
Mock silage, Beach.	769
Cassava bran, a new feeding stuff, Hansson.	769
[Feeding stuffs analyses], Curry and Smith.	769
Commercial feeding stuffs, Hills, Jones, and Williamson.	769
Bran, shorts, and chop-feed, McGill and Clark.	769
Hereditv, Bateson.	769
Genetics and the agricultural college, Detlefsen.	769
Prepotency in Airedale terriers, Haynes.	770
Miscellaneous information concerning the live stock industry, Roberts.	770
[Report of] annual meeting of American Meat Packers' Association, 1913.	770
Slaughter and consumption of food animals in the United States, 1909, Roberts.	770
Australian frozen meat exports.	770
[Live stock in Alaska], Georgeson, Snodgrass, and Neal.	770
[Animal husbandry work in Nebraska].	771
Cattle breeding and the soil and climate of West Flanders, Zwaenepoel.	771
Cattle with "floating horns," Dechambre.	771
Milk required to raise a dairy calf, Fraser and Brand.	771
[Sheep breeding and feeding experiments], Jones.	771
On the effect of castration upon horn growth in Herdwick sheep, Marshall.	772
Lamb fattening, Lonsdale.	772
Reindeer in Russia, Tzvetinovitsh.	772
The maintenance requirement of swine, Dietrich.	772
Swine management in Texas, Short.	773
Bacon for export, Shelton.	773
Racing performances and breeding value in brood mares, Robertson.	773
Developing draft colts, Cochel and Severson.	773
The biology of poultry keeping, Pearl.	774
Notes on the poultry and egg industry in the United States, Lamon.	774
Silver fox ranching in Prince Edward Island, McCready.	774

DAIRY FARMING—DAIRYING.

Report of the Vermont Dairymen's Association.	774
Experiments with chopped beets and beet tops for milk cows, Zaitschek.	774
Preliminary report on the milking machine, Larsen, White, and Fuller.	774
The interpretation of milk records, Gavin.	775
The value of the escutcheon in judging dairy cattle, Moran.	775
Building up the dairy herds of Ohio.	775
Care of the dairy herd.	775
Milk production in Canada, Grisdale.	775
The modern dairy, Wauters and Haentjens.	775
Work of department of milk science and dairy practice, Raudnitz and Grimmer.	775
Studies of the rennet coagulation of milk, Washburn and Bigelow.	775
The effect of watery foods on milk.	776
Influence of fresh and dried distillery waste on milk and milk serum, Weiser.	776
<i>Bacillus lactis fermentens</i> , a ferment of milk sugar, Ruot.	776
The control of bulk milk in stores, Kelly.	776
Legal standards for dairy products.	776
The care of cream for butter making, Barr.	777
The control of the moisture content of butter, Beach, Bigelow, and Allen.	777
The determination of butter gains, Hittcher.	777
Cheese shrinkage, Monrad.	777
Cheese manufacture at the Lodi experiment station, Besana and Samarani.	777
Manufacture of Coulommier cheese, McNaughton.	777
Manufacture of Parmesan cheese and selection of ferments, Besana and Samarani.	777
Desiccated milk, Porcher.	777
A bacterial infection of condensed milk, Thayer.	777

VETERINARY MEDICINE.

Inspection relating to importation and exportation of live stock, Hickman.	778
The meiostagmin reaction and pregnancy, Julchiero.	778
The content in antibodies of normal human colostrum and milk, Tunnichliff.	778
Bacteriological diagnosis of anthrax with the aid of the lung tissue, Szász.	778

	Page.
Infectious abortion of cattle and the occurrence of its bacterium in milk.....	778
Artificial inoculation of cattle with bacillus of contagious abortion, Surface.....	779
The etiology of infectious abortion of mares and jennets, Good and Corbett.....	779
Technique of complement fixation in contagious abortion of bovines, Thomsen..	779
The infection of man with cultures of hog erysipelas bacteria, Krieger.....	780
Malta fever, with special reference to goats, Mohler and Eichhorn.....	780
Paralysis in horses and in cows due to the ingestion of fodder, Gilruth.....	780
Immunization tests in tetanus, Mohler and Eichhorn.....	780
Biochemistry and chemical properties of tuberculous sputum, Eiselt.....	782
Immunizing tests with tubercle bacilli.—Antigenic properties of lipoids, Meyer.	782
Measles in cattle, Ransom.....	782
Necrobacillosis with special reference to balanitis in sheep, Tidswell.....	783
Influence of mode of penetration of <i>Stephanurus dentatus</i> , Bernard and Bauche..	783
The number of red and white blood corpuscles in the sound horse, Schütze.....	783
Internal administration of arsenic in canker and other diseases in horses, Holmes	783
The life history of <i>Sclerostomum bidentatum</i> , Stier.....	783
Eye worm of chickens, Wilcox and McClelland.....	784
Tapeworms of waterfowl, Wundsch.....	784

RURAL ENGINEERING.

Report of the ministry of public works [concerning irrigation].....	784
Pumping plant irrigation, Walker.....	784
Lazwell drainage-pumping plant.....	785
Water conservation and drainage branch, Dare.....	785
Drainage experiments.....	785
The principles of land drainage, Hills, Jones, Williamson, and Burdick.....	785
Explosives in agriculture, Coggins.....	785
Comparison of different types of wearing surfaces used for roadways of bridges..	785
Internal temperature range in concrete arch bridges, Nichols and McCullough..	786
Comparative mortar tests with mixtures of normal and work consistency.....	786
General conclusions on waterproofing methods for concrete structures.....	787
Denatured alcohol as a decarbonizer and engine cleanser, Anglada.....	787
[A steam engine for sun power plants].....	787
Windmill electric lighting and power, Manikowske.....	788
Inaccuracies of indicators, Stewart.....	788
Mechanical safety devices in agricultural work, Puchner.....	788
Stave silo construction, Rowe.....	789

RURAL ECONOMICS.

Hay and history, Simkhovitch.....	789
Indian wheat and grain elevators, Noël-Paton.....	789
Cooperative stock shipping that pays, Tomhave.....	789
The problem of rural credit or farm finance in the United States, Coulter.....	789
Home colonization in Norway.....	789
Agricultural cooperation for farm insurance, Hare.....	790
Hail insurance, Vermorel.....	790
[Market conditions in Alaska], Neal.....	790
Letters from the settlers and reports from the seed distribution.....	791

AGRICULTURAL EDUCATION.

Practical program for agricultural schools, Snedden.....	791
County agricultural high schools, with course of study, Smith et al.....	791
Progress in agricultural education in New York State, Dean.....	791
Horticultural education, McCue.....	791
One year's course in secondary agriculture, Nolan.....	791
Chemistry and its relations to daily life, Kahlenberg and Hart.....	792
Home economics—a bibliography for high schools.....	792
List of references on home economics.....	792
Domestic science in the high school, Latta.....	792
Domestic science in rural communities, Hawk.....	792
Approved methods for home laundering, Vail.....	792
Principles of bookkeeping and farm accounts, Bexell and Nichols.....	792
School and home gardens, Meier.....	792

	Page.
Boys' pig clubs in Alabama, Jones.....	792
Proceedings of Farmers' Institute Workers, edited by Beal and Hamilton.....	792

MISCELLANEOUS.

Twenty-eighth Annual Report of the Bureau of Animal Industry, 1911.....	793
Annual Report of Alaska Stations, 1912.....	793
Twenty-sixth Annual Report of Nebraska Station, 1912.....	793
Twenty-third and Twenty-fourth Reports of New Hampshire Station, 1911-12..	793
Thirty-first Annual Report of Ohio Station, 1912.....	793
Annual report of the director for the fiscal year ending June 30, 1912.....	793
Press bulletins.....	793

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

Stations in the United States.

	Page.
Alaska Stations:	
An. Rpt. 1912.....	722, 726, 735, 742, 743, 770, 790, 791, 793
Arizona Station:	
Bul. 70, Feb. 1, 1913.....	725, 735
Connecticut State Station:	
Bul. 178, Sept., 1913.....	753
Delaware Station:	
Bul. 99, Dec. 1, 1912.....	712
Bul. 100, May 15, 1913.....	793
Bul. 101, May 20, 1913.....	744
Bul. 102, May 1, 1913.....	711
Hawaii Station:	
Press Bul. 43, June 1, 1913....	784
Press Bul. 44, July 1, 1913....	747
Illinois Station:	
Bul. 163, June, 1913.....	772
Bul. 164, July, 1913.....	771
Soil Rpt. 5, July, 1913.....	727
Iowa Station:	
Research Bul. 9, Nov., 1912....	723
Research Bul. 10, Mar., 1913..	712
Maine Station:	
Bul. 214, July, 1913.....	774
Massachusetts Station:	
Bul. 144, July, 1913.....	741
Met. Buls. 295-296, July-Aug., 1913.....	722
Mississippi Station:	
Circ., Work on Alfalfa at Holly Springs, Sept. 1, 1912.	736
Missouri Station:	
Bul. 113, Aug., 1913.....	745
Nebraska Station:	
Research Bul. 3, June 25, 1913.	724
Twenty-sixth An. Rpt. 1912..	736, 771, 793
New Hampshire Station:	
Bul. 163 (Twenty-third and Twenty-fourth Rpts. 1911- 12), Nov. 1, 1912.....	722, 736, 748, 771, 793
Bul. 164, Feb., 1913.....	741
Bul. 165, Mar., 1913.....	769
New York State Station:	
Tech. Bul. 30, July, 1913.....	762
North Dakota Station:	
Bul. 105, Aug., 1913.....	788
Ohio Station:	
Bul. 249 (Thirty-first An. Rpt. 1912), July, 1912.....	722, 793
Bul. 254, Dec., 1912.....	746
Circ. 135, May 1, 1913.....	775
Circ. 136, May 15, 1913.....	775

Stations in the United States—Continued.

	Page.
Ohio Station—Continued.	
Circ. 137, June 9, 1913.....	757
Circ. 138, June 21, 1913.....	728
Pennsylvania Station:	
Bul. 122, July, 1913.....	773
South Carolina Station:	
Bul. 172, Sept., 1913.....	731
South Dakota Station:	
Bul. 144, June, 1913.....	774
Bul. 145, June, 1913.....	728
Vermont Station:	
Bul. 169, Oct., 1912.....	743
Bul. 170, Dec., 1912.....	740, 741, 769, 775, 777
Bul. 171, Apr., 1913.....	736, 739
Bul. 172, May, 1913.....	739
Bul. 173, June, 1913.....	731, 785
West Virginia Station:	
Bul. 140, Apr., 1913.....	744
Bul. 141, Apr., 1913.....	745
Insp. Bul. 1, June, 1913.....	731
Wyoming Station:	
Bul. 99, July, 1913.....	756
 <i>U. S. Department of Agriculture.</i>	
Rpt. 97.....	762
Farmers' Bul. 552.....	738
Farmers' Bul. 553.....	743
Farmers' Bul. 554.....	743
Farmers' Bul. 555.....	751
Food Insp. Decision 152.....	766
Bureau of Animal Industry:	
Circ. 213.....	778
Circ. 214.....	782
Circ. 215.....	780
Circ. 216.....	778
Circ. 217.....	776
Circ. 218.....	776
Twenty-eighth An. Rpt. 1911.	717, 718, 770, 774, 776, 778, 780, 782, 793
Bureau of Biological Survey:	
North American Fauna No. 35.	755
Weather Bureau:	
Bul. Mount Weather Observ., vol. 5, pt. 6.....	721
Bul. Mount Weather Observ., vol. 6, pt. 1.....	720
Mo. Weather Rev., vol. 41, Nos. 5-6, May-June, 1913...	720
Office of Experiment Stations:	
Bul. 256.....	790, 792
Food and Diet Charts (rev.)...	766

EXPERIMENT STATION RECORD.

VOL. XXIX.

DECEMBER, 1913.

No. 8.

Among the topics for discussion before one of the sections at the recent convention of the Association of American Agricultural Colleges and Experiment Stations was the definition and lines of demarcation of research, experiment, and demonstration. The subject was not exhausted and the discussion unfortunately drifted into lines only remotely related to it. The topic did not receive the attention which it deserves, considered both from the importance of the theme itself and the necessity for clear understanding.

In a complex subject like agriculture the difficulty of fixing exact lines of demarcation between these three branches of effort is greatly increased, and up to the present time these distinctions have not been worked out and recognized except in a general way. There has been much speculation and some insistence on the recognition of certain general principles of distinction which have appeared obvious, but the determination of where the boundaries lie, in how far a given piece of work is original in the use made of the data and embodies the essential characteristics of research, there is still much difference of opinion and often confusion. Doubtless there always will be, but our ideas should become clarified as agricultural research grows older and as the field of extension and demonstration becomes more clearly differentiated from experimentation. The boundaries will be constantly shifting, because what is original research at one stage may cease to be at another, and may even pass into the realm of demonstration. But the principles on which distinctions are made will remain the same.

It will hardly be doubted that the essential distinctions between research, experiments, and demonstration tests should be clearly drawn, and that these terms should be restricted to their proper use, at least in technical and official relations. There are several reasons for this. First of all a distinction is made by Congress in the federal appropriations—in the Adams Act as contrasted with the Hatch Act, and in the pending legislation for agricultural extension, which does not apply to experimentation. Furthermore, the scientific world now has a right to expect of men assigned to research a just conception of the standards and the qualities of such activity. And, finally, for administrative purposes it is essential that we think and

see clearly ourselves, and thus make the proper division of effort and adjustment of funds which are desirable in an institution like the experiment station with a duty and a relationship to the industry of agriculture and to the field of science.

The terminology as at present employed means little. Words are used loosely and in a way to confuse the public, and what is more serious, in a way to suggest confusion in the mind of the worker using them, of whom a varied service is required. It is true that definitions are difficult to formulate in such a way as to have much meaning, but there are certain quite definite conceptions of research which prevail throughout the field of science, pure and applied. With these recognized, the other boundaries become clearer.

Beginning at the top, then, one of the most satisfactory definitions of research is "diligent, protracted investigation, especially for the purpose of adding to human knowledge. . . . Specifically in science, a systematic investigation of some phenomenon or series of phenomena by the experimental method, to discover facts or to co-ordinate them as laws." It is, therefore, scientific, it is systematic, it is extended inquiry, it employs the experimental methods, and it proceeds by the discovery of facts, which alone or coordinated contribute to understanding or permit laws or principles to be developed.

The term investigation is largely used synonymously with research. To investigate is "to inquire into systematically; ascertain by careful research." The same general method and character of inquiry are implied in both—"systematic examination of some scientific question, whether by experiment or mathematical treatment." If there be a difference, it is one of degree rather than of kind. Both aim at the advancement of definite knowledge through science. It is therefore the method and essentials of science that we are concerned with in reaching conceptions of research and investigation in any field.

First of all science is a matter of classification, a bringing together of facts in a system of relations. The function of science is to teach us the relations of facts to each other and their consequences. Science does not teach us the true nature of things—what heat is, what electricity is—it can only give a crude idea of these, but it can teach us the true relation of these things, their attributes, and their consequences. A recently published translation of *The Foundation of Science*, by H. Poincaré, a French mathematician, is remarkably illuminating in defining the nature of science and the method by which it is developed; and while it deals largely with the philosophy of pure mathematical and physical science, it will be found helpful in any study of this subject.

Science, whether for itself or as applied to any particular class of phenomena, is developed through research. In agriculture we deal largely with natural phenomena of endless variety; while the object sought is ultimately practical knowledge or information, the standards and the methods must conform to those of science in general. The method of science is that of observation and experiment, guided and supported by reason and generalization. Observation and experiment teach facts; and in all science investigation consists in passing up from the fact to the law, and in discovering the facts capable of leading to a law or conclusion. Facts and laws are not artificial or accidental, and are not made by the scientist. Man's only originality in connection with them is their discovery.

Observation and experiment are therefore fundamental to progress in natural science. Because of this and because "it is better not to see than to see wrongly," these observations should be made with care and skill and so planned as to furnish a clear, decisive result which can be given a safe interpretation. This is the great secret of success in agricultural investigation. The subject and the conditions are unusually complex, and the results are very likely to be complex, embodying a variety of factors and dependent upon many limiting conditions. For this reason the conditions of the experiment must be as simple as possible, and limiting factors checked or controlled to the utmost degree. In this way the number of variants will be reduced to a point where safe deductions can be made as to their several effects. The attempt to make an experiment answer too many questions, with a result that is fatal to the whole undertaking, is perhaps one of the most common errors of the over-ambitious worker.

Facts differ widely in their importance. We must be sure in the first place that what we determine is actually a fact of a permanent character, and not merely the result of a particular combination of circumstances that might never occur again. This means a greater refinement of method than is usual in the common field and feeding experiment, a provision of methods and checks which will bring conditions more largely under control. But among established facts some are pregnant and others sterile, some have no reach—they teach us nothing beyond themselves, and the scientist who has ascertained them has not become more capable of foreseeing other new facts. On the other hand, there are facts of great yield; each of them marks a definite contribution or step in advance and foreshadows the way for further progress. Isolated facts in agriculture do not always have the constructive value that such facts may have in a pure science, because the investigator is skeptical of them, knowing the liability to faulty observation.

Some have contended that all facts are contributions to knowledge, and that as research depends on the determination of facts the counting of the blades of grass on a plat or the leaves on a tree, wholly apart from any further connection, is research. The results are new facts which apply to the particular case in question, but such facts of themselves have no reach or significance, no permanent value, and represent only routine activity. Their determination does not form the part of a plan or supply a link in a theory, and is not guided by any scientific purpose. No matter how scientifically accurate such facts may be their determination manifestly is not what we understand by research. In much the same way, the making of analyses is in itself not research, although it may be important to that end. Without a guiding purpose that leads beyond the mere determinations they represent routine work. In research the determination of facts is guided by a purpose and aim, and implies a use.

The cataloguing of isolated facts without deducing from them their causes or consequences or relations is not to be classed as research. Merely to observe is not sufficient. The observations must be used. We can not be content with the bare facts of the experiment. To do so would be to mistake the true nature of science. Isolated facts have little scientific value until they are arranged and correlated. The scientist must set in order. "Science is built up with facts, as a house is with stones. But a collection of facts is no more science than a heap of stones is a house."

Underlying all research is a definite purpose, a problem which the investigator aims to solve by the marshalling of experimental facts and observations, and their interpretation. Research, therefore, is directed in its selection or determination of facts. We can not know all facts and hence it is necessary to choose those which are worthy of being known, or which for the time being meet the special needs of our investigation. Hence, also, observation and experiment should not be allowed to run wild, to wander wherever the facts may lead, but directed for the time being to the special problem under investigation. Fugitive effort accomplishes little.

The choice of facts is a large element in the method of science. Research advances by a procession of experiments skillfully and intelligently planned to supply the needed facts. Experiments are not made at random or by chance or to see what will happen, if they form a part of research, but advisedly, as a means to an end, and as an outgrowth of the working plan or of what previous experiments have suggested. They are devised for a definite purpose, and in the belief that they will yield the facts needed. It is a part of the function of the skilled investigator to devise ways of getting at the facts needed for his problem.

In pure science certain facts are considered more interesting than others because they complete an unfinished harmony, or because they make one foresee a greater number of other facts. "Above all, the scientist must foresee." The securing of facts of such reach that they enable many others to be foreseen is one conception of fundamental research, as it is a justification of "science for science's sake."

"The most interesting facts are those which may serve many times; these are the facts which have a chance of coming up again." They are the simple facts rather than the complex. As the biologist studies the cell rather than the whole animal, the investigator in any branch of agriculture must resolve his subject, which is always complex, into the simple factors that comprise it. The difficulty lies in this analysis. Too often what are really lines of work rather than integral phases have been the subjects of study. Cheese making, for example, is not a project for investigation but a line of study. So long as the experiments related to the process as a whole instead of to particular aspects of it little more resulted than poorly understood rules. How little we knew about the actual importance of various operations in cheese making until many, many detailed studies of small factors in the various stages of the process enabled the real and essential facts to be separated out from the dogmatic rules, and these facts to be classified and arranged into a system of relations that has given a science of cheese making.

Having selected a definite restricted problem, a theory or hypothesis is essential for outlining the plan of attack, as a starting point and as a guide in the conduct of the investigation. We often hear reference to the danger of a preconceived idea. It is not unscientific to have a quite definite preconceived notion, provided it is not allowed to control and bias the investigator. On the contrary, all research implies hypothesis, for it is an accepted axiom of science that "without hypothesis, no science."

"Hypothesis has a necessary rôle that no one has ever contested. Only it ought always as soon as possible and as often as possible to be subjected to verification. And, of course, if it does not stand this test it ought to be abandoned without reserve." The danger of hypotheses lies in making them unconsciously or without proper foundation, in accepting them as truth, and in clinging to them in spite of evidence. This danger is far greater in biological sciences which enter into agricultural investigation than in those having the precision of mathematics and capable of proof. The discarded hypothesis is not barren, for it has given a negative result and led to the opportunity for discovery. Without the hypothesis the experiment would have been mere chance, and hence have been lost because of the inability of the observer to see anything extraordinary in it.

But essential and helpful as is hypothesis, experiment is, in the subjects with which agricultural research deals, the sole source of truth. It alone can teach us anything new; it alone can give us certainty.

Success in research depends not alone on skill and ingenuity in planning experiments, but on foresight in generalizing from the facts secured. The scientist must be able to look beyond what the bare facts demonstrate, and to derive suggestions from them. A good experiment has been defined as one which informs us of something besides an isolated fact—which enables us to foresee through generalization. For without generalization knowledge is impossible.

Aside from its own intrinsic value each demonstrated fact enables the investigator to foresee other apparent facts, the essential features of which must be verified by experiment at the first opportunity, but which in the meantime enable further foresight, although without absolute certainty. As experiments are time-consuming, knowledge can never be fully supported on verified experiments, hence it is necessary to get the utmost possible number of predictions from every experiment, and with the highest possible degree of probability. Generalization must be directed in such a manner as to increase "the yield of science."

"Knowledge is not a gift of bare experience nor even made solely out of experience." The creative activity of the mind is an important essential in its derivation. We report facts, and we say we let them speak for themselves. But as we investigate we inevitably interpret the results as well as record them. Research leads outside the field of human experience and beyond experiment, and through constructive reasoning extends the boundaries of knowledge.

These things point to the necessity for reflection in productive research. The experiment is only a means to an end; the fact in and of itself may be barren if merely observed and chronicled. It is the skill and foresight of the investigator in deriving his facts, and the use which he is capable of making of these facts in seeing relations which are not obvious to the layman, supporting and developing his hypothesis, and guiding his further experiments, that determine his research ability. The unreasoning making of experiments bears no stamp of originality, leads nowhere except by the sheerest chance, and is not of the nature of research. It is what the scientist puts into the contemplation of the facts, the point of view they give him, and the further plans they suggest to his mind that make them virile.

This means that the investigator must be a student as well as an experimenter, must study his results critically to determine their true significance and relationship and reach, and interpret them in their bearing on his hypothesis. Unless he can take the time for this he will often miss the significant points in his experiments, will not

be guided by what has gone before, and his investigation will devolve into a round of routine.

In a word, then, research advances by a procession of experiments and observations, based on hypothesis and guided by the foresight which generalization supplies. Science prospers through empirical discoveries, and the theory must not run counter to any positive empirical facts; but science does not stop with their determination. It demands the reason, the connection, the law. These are derived through induction from facts developed by experiment which support the theory or the principle or the conclusion at essential points. Without these steps research lacks the essential features. This is as true in agriculture as in any primary science.

But research is not the sole source of knowledge and there are many additions to knowledge of a sound, scientific character, whose derivation does not seem to answer the definition of research. Among such are discoveries made perhaps by chance observation, or the recognition of a fact in an experiment, possibly in the course of research but not an outgrowth of it. These may have all the weight of scientific facts, constitute contributions to science, and be strictly original, but still not represent research. This makes them no less valuable or dignified.

Research carries the idea of a protracted inquiry; it is a conscious, premeditated effort in the working out of problems usually not solved by a single experiment, but requiring progressive study through a series of experiments from which the answer is gradually evolved. If we are to accept the definition of the sciences, agricultural research is to be understood as an excursion into the unknown, involving a combination of various types of effort—hypothesis, experiment, generalization.

It will be recognized that in contrast to research, what in agriculture we commonly designate as "experiments" are much simpler in their aim and plan, and lack the finality of research. They are usually satisfied with the empirical result. They may not even be original, for the Hatch Act provides for verification experiments, and many experiments aim merely to test out or adapt the conclusions from former work to a new locality or a new set of conditions. They may not even be scientific in the sense that they seek strictly scientific facts, but they should be made with the care and precision of science. Such are many of the commercial experiments, to determine economical methods of practice or relative values. Usually the results are of a more or less temporary nature.

A large share of the ordinary field and feeding experiments are comparative trials rather than strictly scientific investigations. They are made under presumably quite uniform conditions, and hence the

results of the comparisons in a given experiment are fairly comparable one with another, but not directly comparable with those in other trials, where the combination must necessarily be different. They report the findings under a given set of conditions, which may not recur completely another year or in another locality. Most of them are influenced by factors which it is impossible for the experimenter to take full account of, because he does not know the measure of them. The conditions of experiment differ therefore from the control conditions of the laboratory.

The aim of many experiments is to get a relatively quick result, without resorting to the precision and detail of thoroughgoing investigation. In many cases this meets the immediate need of the problem and of practice. To know that fall plowing, for example, better prepares the land in a given locality for a particular crop is quite sufficient, and to determine just why this is true would probably involve a more intricate series of investigations than we are at present able to carry out, there are so many factors of soil, moisture, biology, and chemical and physical change to be taken into account. On the other hand, many classes of experiments are of such a kind or have been so often repeated and checked under varying conditions that quite broad generalizations may be drawn from them.

Taken as a whole, this grade of inquiry has been of inestimable service to American agriculture, in developing practical methods, leading to a broader understanding, and making farming a more intellectual and profitable occupation. There is still need for work of this class and provision is made for it in the federal appropriations. For many years to come it will very properly constitute a large share of experiment station effort.

But, like research, it should be progressive, recognizing that advancement depends on building upon the things that have become known. After a certain number of experiments on a given topic have been made it is well to consider whether it is worth while to continue them. In certain classes of such work there is an endless number of different combinations which may be made, but most of these may give no new results of value. The experimenter using public funds should be careful not to extend such work beyond what is actually needed. At the present stage we must regard certain facts as practically established, in so far as it is possible to establish them by the methods employed, and direct our effort to other lines of inquiry, rather than move in circles. The methods, also, should be progressive, in order that gradually questions may be dealt with in a way to give a more enduring and intelligent answer; and, finally, these experiments, whose limitations are recognized, will often suggest subjects for systematic research. For we need a broader founda-

tion of definite agricultural knowledge, and the methods of the ordinary isolated experiment can not alone furnish the foundation for a science and a well-rounded theory of American agriculture.

The line which separates the ordinary experiment from a demonstration trial is a changing one. What is an experiment in a new field this year may be a subject for demonstration trials next year or the year to come, and the provision of agencies for demonstration should lead to a closer scrutiny of the experiments conducted by the station, often with the result of elimination. The experimental work and the demonstration work represent separate fields. They should not overlap, and the desire of the station man to test out locally the result of his experimental findings should not lead into a series of purely demonstration trials.

The field experimenter is justified in repeating his experiments on different types of soil or under different climatic conditions sufficiently to test the validity of his deductions in the principal agricultural regions of the State; but it is useless for him to attempt experiments on hundreds of farms when the probability is that all the essential features of the experiment will be covered by a very limited number. Indeed, it may well be questioned whether he is within his field as a station man in doing so. One effect of this outlying work, where carefully done, has been to emphasize the distinction between an experiment made to secure information and a demonstration designed to impart it. The experiment to be of general value must be made under control conditions, and not be subject to the convenience or judgment of the farmer, who rarely understands the necessity for method and precision. Field experiments which are not thoroughly supervised and controlled by trained experts have little experimental value, and hence stations which are doing careful work make the absolute control of the land and direction of the work a condition of local experiments. This is not usually required or thought desirable in the case of demonstration trials, which indicates a distinct difference in the character of the two lines. It might reasonably mark a boundary line between them.

There comes a time when the result of experiment must be given to the public, through the bulletins and other agencies for getting it before the people. That time comes when the experimenter is reasonably sure of the accuracy of his results—when his work has passed the experimental stage. Then it is ready to be taught. There should be no hesitancy on his part to then pass it over to the extension department through which it will be demonstrated to the farmers of the State. On the contrary, considering the great number of problems needing solution, the station worker ought to welcome the pres-

ence of the demonstrator, and be eager to get as many suggestions as possible from his attempts to teach the results to the farmers. If the author of the work serves in the dual capacity of experimenter and demonstrator, he should be just as careful to keep the distinctions of the two types of service clearly in mind.

But the time is here in many States, and rapidly approaching in others, when a man must be content to be primarily one thing or the other, an experimenter or a demonstrator. He must make the choice, for the opportunity now lies open in both fields. It is well that he should consider the work and his interests carefully and then choose, and having made his choice to shape his work accordingly.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Fruit juices, F. THOMPSON and A. C. WHITTIER (*Delaware Sta. Bul.* 102, pp. 28, figs. 7).—This is an account of preliminary work on an investigation of the exact nature of the chemical compounds which exist in fruits at various stages of maturity and the reactions taking place therein. The fruits studied were one variety each of strawberries, peaches, pears, apples, and grapes. The first samples of fruit were taken soon after they were set and the analyses were continued from time to time until complete maturity. In the work the sugars present in the juices were assumed to be sucrose, dextrose, and levulose.

In polarizing at high temperatures with the ordinary water-jacketed polariscope tube, much difficulty was experienced in obtaining a clear and unobstructed field of vision. For correcting this a modified form of instrument (which is illustrated) was employed which permits the introduction of a hot water oven between the analyzer and polarizer whereby a uniform temperature may be maintained (at any point within 0.1°) throughout the length of the tube, and a clear field of vision is obtained. The heating chamber is entirely separate from the optical parts of the instrument. For inverting sucrose Hudson's invertase method (*E. S. R.*, 22, p. 412) was employed.

The results seem to show that dextrose and levulose are the first sugars to appear and that they are the dominant sugars until maturity. Both of these monosaccharids are almost present in the proportion of invert sugar, i. e., the dextrose content is slightly higher. In the grape, levulose and dextrose are present practically as invert sugar at all stages and no sucrose was noted at any stage (*E. S. R.*, 25, p. 504).

It was also found that the average molecular weight of the solids in the juice increases as the fruit arrives at maturity. This is particularly true of the fruits which carry sucrose. The gain in weight, however, is greater than can be accounted for with sucrose. "From calculated molecular weights determined, it is evident that in the peach there are bodies of low molecular weights being formed along with the sucrose, counterbalancing to some extent the effect of the increasing sucrose." The principal sugar present in the peach is sucrose. Dextrose and levulose exist in almost equal proportions.

In the apples and pears examined, the principal sugar present throughout the ripening process was levulose. Sucrose appeared early in the apple, and dextrose when the fruit was almost mature, but only in small quantity. Both of these fruits are the only ones of the 5 examined which contained starch in appreciable amounts, and the appearance of the starch seemed to be accompanied by a disappearance of the dextrose.

The osmotic pressure of the fruit juices increased considerably up to the final stage of ripeness but most rapidly in the later stages. An exception was the strawberry, which maintained a low osmotic pressure during all stages. "Ionization as shown by the depression of the freezing point was slight in all the juices with the exception of the grape juice, which showed a high ioniza-

tion. . . . Invert sugar of a monosaccharid appears to be the first sugar formed in the green fruits studied. As a tentative theory in regard to the formation of carbohydrates we would advance the following: That sucrose and starch are formed as reserve materials, the former from equal amounts of levulose and dextrose, the latter from dextrose alone; that these reactions are reversible, the dextrose being more readily used in respiratory processes, thus favoring an accumulation of levulose."

"There was no appreciable or consistent change in the amounts of either acid or ash in any of the fruits."

Soy-bean oil, F. THOMPSON and H. H. MORGAN (*Delaware Sta. Bul. 99, pp. 13*).—Although soy-bean oil is used in the United States and the plant can with reasonable certainty be brought to maturity in almost every part of the country south of the fortieth parallel, very little or no oil is manufactured here. In order to determine the quality of the oils obtained from soy beans grown at the Delaware Station for fodder or green manure, several varieties were extracted in 5-lb. lots with 86° B. gasoline. By this procedure about 80 per cent of the oil contained in the bean was obtained. Forty-eight varieties of beans gave an average of 19.22 per cent of fat when extracted with ether.

"The oil thus prepared was of a uniform, light amber color, showing little variation although the beans were of almost all shades of color from light yellow to black, showing that little if any of the coloring matter of the bean was extracted by this solvent. The constants on the oils obtained from the different varieties showed little variation although some of the varieties were of widely different types." The maximum specific gravity of the samples was 0.9235, the minimum 0.9108, and the average 0.9193; the corresponding saponification values 195.4, 174.08, and 187.27; and the iodine values 138.96, 114.01, and 129.72.

A composite sample of the oils gave a saponification value of 188.65, acid value 0.28, Reichert-Meißl value 5.3, Hehner value 93.5, neutralization value 177.82, iodine value of oil 127.78, iodine value of unsaturated fatty acids 131.93, unsaturated fatty acids 84.7, saturated fatty acids 8.61, ether number 188.37, glycerol 10.29, and mean molecular weight 315.5.

As compared with linseed, cotton-seed, and corn oil, soy-bean oil is of the corn-oil type of semidrying character. "Probably the most important use of the oil is in the manufacture of soaps, for which purpose it compares very favorably with cotton-seed oil. Being a semidrying oil it has also found some application in the manufacture of paints, and while it probably can never wholly displace linseed oil for this purpose, it appears that when mixed with linseed oil in proportions as high as 25 per cent no inferior qualities are shown in the paint. It is possible that, with suitable driers, it may find more extended use for this purpose."

The composition of soy-bean cake, and hence its feeding value, depends very much upon the method used in extracting the oil. Pressed cake, as analyzed, shows more oil (6.1 per cent) and contains a little less protein (43.29 per cent), nitrogen-free extract (34.04 per cent), and moisture (11.11 per cent), than the cake extracted with a solvent.

The total value of an acre of soy beans when grown for oil is estimated at about \$30 to \$35, as compared with about \$20 when grown for green manure.

Lactic acid in corn silage, A. W. DOX and R. E. NEIDIG (*Iowa Sta. Research Bul. 10, pp. 365-378, figs. 4*).—In previous work (E. S. R., 28, p. 608) it was shown that the total volatile acids recovered by distillation from corn silage did not account for all of the acidity observed by the direct titration of the original silage juice. The difference was supposed to represent nonvolatile acid which heretofore had been assumed to consist almost entirely of lactic acid.

It is also generally conceded that the nonvolatile acid is present in the larger quantity in silage. The purpose of this work was to determine how much of the nonvolatile acidity (usually calculated as lactic acid) is actually due to lactic acid, to determine the optical forms in which it occurs, and to ascertain whether the kind of silo has any influence upon the amount and character of the lactic acid produced. In the work the zinc lactate method was employed.

The experimental data showed that lactic acid is present in silage under normal conditions and in excess of the volatile acids. The average ratio was 1:0.75. The acid occurs in the optically inactive or racemic mixture form. In order to determine whether racemization did not occur under the experimental conditions employed, samples of the optical form of acid were prepared, but it was found that neither the levorotatory or dextrorotatory forms of acid were changed under the conditions which prevailed during the experiment.

The importance of hydrocyanic acid and glucosids as producers of hydrocyanic acid in plant chemistry, A. JORISSEN (*Bul. Soc. Chim. Belg.*, 26 (1912), No. 5, pp. 199-205; *abs. in Chem. Ztg.*, 36 (1912), No. 117, *Repert.*, p. 526).—A historical résumé of the occurrence of hydrocyanic acid in the plant world is followed by a review of the newer work, which is discussed critically. Special emphasis is placed upon the results obtained by Belgian investigators in regard to cyanogenesis.

Studies on enzym action.—III, The action of manganous sulphate on castor bean lipase, K. G. FALK and M. L. HAMLIN (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 2, pp. 210-219).—This continues work previously reported (*E. S. R.*, 27, p. 802) in which it was stated that the activation of lipase was probably due to some oxidation reaction. Hoyer^a having found that the addition of manganous sulphate increased the activity of lipase, tests were made to determine whether the manganous salt was an oxygen carrier and was capable of activating castor bean lipase by an oxidation reaction.

"The main conclusion to be drawn from the experiments described is that the castor bean lipase preparation after having been inactivated by heating with water was rendered active again to a small extent by manganous sulphate. Attempts were made to use oxygen carriers other than manganous sulphate, but those tested, including ferrous sulphate, hydrogen peroxid, and potassium persulphate, showed themselves such marked hydrolytic action on the ester that the testing of the preparations after such treatment gave results of no value.

"The formation of acid in the treatments to which the preparations were subjected could not have been the cause of the observed activities, as the experiments where manganous sulphate was absent did not show the activities even with the increased acidities. In order to account for the accelerating action of manganous sulphate on castor bean lipase, as observed by Hoyer and by Tanaka (*E. S. R.*, 28, p. 610) and in the experiments described in the present paper, the following tentative explanation is offered: The inactive zymogen of lipase in castor beans is converted into the active enzyme by an oxidation reaction for which the presence of an oxygen carrier or catalytic agent is necessary. Simultaneous hydrolysis may or may not be involved in this reaction. The active enzyme is converted into inactive material by hydrolysis, slowly at low temperatures in aqueous solution or suspension, rapidly at higher temperatures. Presumably all of the substances involved in these changes, inactive zymogen, active enzyme, inactive product from enzyme, are protein in character.

^a Hoppe-Seyler's Ztschr. Physiol. Chem., 50 (1907), No. 4-5, pp. 414-435.

"The application of this explanation to the observed results is simple. Manganous sulphate, at any rate in the small amounts used in the experiments described in this paper, does not accelerate directly the action of the enzym present, but by aiding the conversion of inactive zymogen into active enzym increases the total amount of enzym present, or makes up for the enzym which becomes inactive on account of hydrolysis, and therefore apparently accelerates the action. Heating the preparations with water hydrolyzes all of the active enzym to inactive substance but evidently does not destroy all of the inactive zymogen present originally in the castor beans, as the experiments showed a small activity of this heated material after treatment with manganous sulphate. The explanation of the results described here is, therefore, not that enzym which had been inactivated was made active again, but that the preparation which had been inactivated still contained some zymogen from which active enzym was again obtained."

Analysis of the ash of the castor bean, M. L. HAMLIN (*Biochem. Bul.*, 2 (1913), No. 7, pp. 410, 411).—Continuing the above work, an analysis of the ash of the substance obtained by cold pressing and ether extraction of castor bean kernels (such as has been previously used in lipolytic experiments) was made, especially in regard to manganese, and in the dry oil-free kernel 0.00056 per cent was noted. When calculated to parts in 100 parts of ash, 0.0076 was obtained.

Symbiosis by various types of yeast, A. J. J. VANDEVELDE and L. BOSMANS (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 14 (1912), Sect. VIb, pp. 191–202; *abs. in Chem. Ztg.*, 36 (1912), No. 118, p. 1141).—Although the yeast used in the fermentations is seldom pure and generally consists of 2 or more types, the question of symbiosis of these types has rarely been studied. In order to study this phenomenon, various yeasts were taken, viz. *Saccharomyces cerevisiae* types, Carlsberg, Saaz, Froberg, Logos, *Schizosaccharomyces pombe*, and *Zygosaccharomyces priorianus*. As culture media the following were used: (a) 56.86 gm. of glucose + 20 gm. of Witte peptone per liter; (b) beer wort containing 54 gm. of maltose per liter; and (c) 54 gm. of saccharose + 20 gm. of Witte peptone per liter. The fermentations were all conducted in Erlenmeyer flasks and the carbon dioxid evolved was determined every day.

The results show that symbiosis in most instances favored the degree of fermentation. The results obtained by mixing the Carlsberg and Saaz types were especially interesting. The most unsatisfactory results were obtained with a mixture of the Froberg and Logos types. With *Z. priorianus* obtained from honey the fermentation was of a low degree. Logos, Pombe, and Froberg types, when together, were antagonistic. The nutrient fluid was also found to have an effect on the symbiotic process. In media containing glucose and peptone the results were better than those obtained in solutions of saccharose and peptone, and in the last named medium they were better than with maltose and beer wort.

The conclusion drawn is that mixed cultures give better results for the fermentation industry than pure cultures.

The influence of temperature upon the physiological processes produced by alcohol yeast, J. E. VAN AMSTEL (*De Temperatuursinvloed op Physiologische Processen der Alcoholgist. Proefschr., Tech. Hoogeschool Delft, 1912, pp. XI+237, pls. 4, figs. 30*).—After giving the theoretical and empirical views in regard to the physiological processes relating to the production of alcohol by yeast, the author reports experimental data.

Alcoholic fermentation, A. HARDEN (*London, New York, and Bombay, 1911, pp. 1X+128, figs. 8*).—This monograph on biochemistry contains chapters based

on a course of lectures given on alcoholic fermentation at London University and the Royal Institution during 1909-10, including zymase and its properties; the function of phosphates in alcoholic fermentation; the coenzyme of yeast juice; action of some inhibiting and accelerating agents on the enzymes of yeast juice; the by-products of alcoholic fermentation; the chemical changes involved in fermentation; and the mechanism of fermentation. An extensive bibliography embracing 272 titles is appended.

In regard to the constitution of proteins, with special reference to C. Reichard's mercury salt reaction, G. ROTTKE (*Untersuchungen über die Konstitution des Eiweisses unter Berücksichtigung von C. Reichards Quecksilbersalz-Reaktionen. Inaug. Diss., Univ. Bern, 1910, pp. 39*).—Proteins have reducing groups in their molecule for the mercury salts. Amino acids were found to be capable of reducing mercurous nitrate and ammonium molybdate. Glucose possesses the same properties. It was not possible with the reagents used to determine whether it was the amino acids or a hexose in the molecule which brought about the reduction.

Some tests were also made with mercuric chlorid but with negative results. The protein preparations tested were blood albumin, alkali albuminate, globulin, blood fibrin, casein, peptone, peptone and albumin gelatin, etc.

Investigation by means of the dilatometer on the heat coagulation and solution of albumin, T. GAYDA (*Biochem. Ztschr., 39 (1912), No. 5-6, pp. 400-409, fig. 1; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 595, I, p. 399*).—It is shown that the thermal expansion of pure albumin is greater than that of water.

"The volume changes taking place when the temperature is very slowly raised during coagulation are very small. Below the coagulation temperature, the rate of increase of volume change is greater and remains so while the clot is forming, but falls to a slower rate of increase as the albumin reaches the stage of complete coagulation. During the solution of albumin a contraction of volume takes place. This is possibly due to a true solution of the water in the substance of the colloidal particles."

Specific rotation of fructose, B. TOLLENS (*Ztschr. Ver. Deut. Zuckerindus., 1912, No. 674, II, pp. 360, 361; abs. in Chem. Ztg., 36 (1912), No. 42, Repert., p. 217*).—A revision of the work of Winter and Herzfeld (1888), in which marked variations in $\alpha_D = -71$ to -77° were reported, is shown to rest on an error in calculation. It is claimed that Winter's figures should be $\alpha_D = -92.22$ and -106.14° and Herzfeld's, $\alpha_D = -93.59^\circ$. These figures agree very well with those generally considered correct.

The quantitative determination of saccharose in various foods and condiments, A. JOLLES (*Abs. in Chem. Ztg., 36 (1912), No. 115, p. 1100*).—The detection of saccharose, when other sugars are present, by the method recommended by the author (E. S. R., 25, p. 806) has the disadvantage that the reducing sugars in decinormal alkali solutions must not exceed 2 per cent, because with the usual decolorizing methods filtrates are obtained which can only be polarized with difficulty. Some tests have now shown that 10 per cent solutions of reducing sugars treated with one-fifth-normal alkali solution after 24 hours at 37° C. lose their optical activity. Very dark solutions are also obtained.

Using the principles pointed out by Neuberg and Ishida (E. S. R., 27, p. 714) for obtaining colorless filtrates, the method has been modified as follows: A measured volume of the fluid to be examined, which has been treated with one-fifth-normal alkali at 37° C., is neutralized with dilute acetic acid, and a 50 per cent solution of mercuric acetate is added until a precipitate is no longer produced. The total volume of the fluid and precipitate is then noted. To an aliquot of the filtrate from this mixture a 25 per cent phosphotungstic acid

solution is added until precipitation is complete; then the bulk of the mixture is noted, and it is filtered and polarized. The polarization, after allowance is made for the dilutions brought about by the mercuric acetate and phosphotungstic acid solutions, shows the percentage of saccharose.

Various saccharine solutions were examined by this method, and the amount originally added was found. The method can be used for examining sweet wines, fruit juices, marmalades, sirups, dried milk, etc.

The influence which peptone has on the determination of sugar by Fehling's solution, A. BERNARDI (*Biochem. Ztschr.*, 41 (1912), No. 1-2, pp. 160-164; *abs. in Zentbl. Physiol.*, 26 (1912), No. 17, p. 766).—High results are obtained by the gravimetric method if peptones are present.

The quantitative determination of glucose in the presence of other substances according to G. Bertrand's method, M. ROSENBLATT (*Biochem. Ztschr.*, 43 (1912), No. 5-6, pp. 478-480).—Although it is claimed (E. S. R., 27, p. 714) that no polarimetric method, even when foreign optically active bodies are absent, is very sensitive when minute amounts of sugar are present, G. Bertrand's method^a has been used by the author with success, especially where glucose was present in a solution containing amino acids and similar bodies. While the substances which interfere may be removed with a satisfactory precipitating agent, this is not always necessary, because certain bodies which interfere with the optical activity may be safely disregarded when determining sugar by the Bertrand method.

In this connection solutions containing glucose and glycocoll, alanin, leucin, tyrosin, asparaginic acid, asparagin, betain, glutamin hydrochlorate, urea, Witte peptone, or Chapoteaut peptone, were examined without removal of the interfering bodies.

The polarimetric determination of starch, C. J. LINTNER (*Abs. in Chem. Ztg.*, 36 (1912), No. 68, p. 639).—The modification proposed by Wenglein in which the solution of starch is brought about by sulphuric acid (specific gravity 1.7), after the addition of water, has given considerable difficulty when used for barley in the summer time. At this season the reagents often have temperatures far above 20° C., and this produces a cleavage of complexes having a low rotation; consequently the results obtained in the final calculation are low.

Sulphuric acid is not so well adapted for dissolving starch as hydrochloric acid, and the results obtained with the latter are more constant. Tests were made at the Brewing Experiment Station at Munich for the purpose of establishing whether under certain conditions values could be obtained which would compare well with those given by hydrochloric acid. It was found that $\alpha_D = 198^\circ$ could only be obtained with sulphuric acid.

Colorimetric determination of alcohols in the presence of ketones, H. AGULHON (*Ann. Chim. Analyt.*, 17 (1912), No. 2, pp. 50-54; *abs. in Chem. Ztg.*, 36 (1912), No. 39, *Repert.*, p. 197).—These are color reactions with certain organic substances, mineral acids, and potassium bichromate.

The detection of formic acid in meat, O. KAPIN (*Ztschr. Fleisch u. Milchhyg.*, 22 (1912), No. 10, pp. 308-312).—Formic acid when added in small amounts to meats goes into chemical combination with the protein and extractive substances but not with glycogen, and can only be detected with difficulty in the distillate. In fact, this is often impossible in the concentration in which it is used for preserving meats.

With casein practically all the formic acid could be recovered, but egg albumin, glue, and myosin (paramyosin) fixed large quantities of the substance.

^a *Bul. Soc. Chim. France*, 3. ser., 35 (1906), pp. 1285-1298.

The detection of formic acid in sirups, H. KREIS (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsundtsamt.*, 3 (1912), No. 5, pp. 266, 267).—Natural raspberry juice contains only infinitesimal amounts of formic acid. In order to obtain correct results it is necessary to distill with steam and without the addition of sulphuric acid.

Biochemic reactions and the bacterial count of milk, H. C. CAMPBELL (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1911, pp. 195–224, pl. 1, fig. 1*).—In cooperation with the Pennsylvania Live Stock Sanitary Board, comparisons were made of the catalase, acid, reductase, fermentation, alcohol, and temperature tests with the bacterial count.

There seemed to be little difference in the catalytic power of the milk of individual cows drawn at different intervals after milking and kept in the refrigerator at 15° C. When, however, the milk was taken from the udder at different times of the day, more catalase seemed to be produced in the middle of the day. The alcohol test was negative in almost all cases.

The milk from a Jersey cow in an advanced period of lactation, and suffering from a severe form of gastro-enteritis, was examined for a period of 12 days. "The milk from the animal reacted strongly to the alcohol test. . . . The percentage of sediment and leucocytes contained in the milk by the Tromsdorff method was 0.1. The number of leucocytes per field by the Stokes method was 93. The number of bacteria contained in the milk per cubic centimeter was 1,840." None of the bacteria was pathogenic. The catalase and alcohol tests were found to run very uniform. The alcohol test was positive in every instance, but the amount of oxygen evolved was not abnormal. The presence of a certain amount of albumin seemed to produce a positive alcohol test.

Chloroform (2 per cent) or formaldehyde (1:4,000), when added to milk as a preservative, did not seem to affect the production of catalase.

From some tests made with extracts of the mammary gland tissues, it is noted that by passing the extract through a Pasteur porcelain filter the catalase was removed. If, however, the extract is passed through a filter paper, the filtrate is found to contain a large amount of catalase, as shown by Grimmer (*E. S. R.*, 21, p. 574).

The influence of certain bacteria on catalase production was studied. "The *Bacillus prodigiosus*, *B. subtilis*, *B. proteus*, and *B. coli* were all found to increase greatly the production of catalase. Contrary to some investigators, we found the *B. acidi lactici* to produce a small amount of catalase, and the streptococcus used in these experiments also produced only a small amount of catalase. Further investigations will be necessary to enable us to state just what types of streptococci are producers of catalase."

Colostrum was found to have a large catalytic activity. Under the conditions of the experiment, colostrum yielded 16 cc. of oxygen, cream of colostrum 7, skimmed colostrum 7.5, and leucocytes plus a trace of skimmed colostrum 0.5 cc. of gas in 45 minutes.

The results obtained by Jensen (*E. S. R.*, 21, p. 523) with the reductase test were confirmed.

The Swiss fermentation test was carried out by placing 40 cc. of milk in a large test tube and incubating at 37° for 48 hours. The character of the curd was then judged according to criteria presented.

One hundred samples of milk were examined for the purpose of making a comparison of the various biochemic reactions with the bacterial count. "Of the 100 samples examined, 38 gave a catalase reading of 4 cc. or more of gas. The average number of bacteria contained in these 38 samples was 4,067,260. Of these samples 36.8 per cent gave a negative reaction to the alcohol test, and 63.2 per cent gave a positive reaction. . . . Undoubtedly, the alcohol test is

a simple one, and very small alterations in the udder can be readily detected by this test. More experiments will have to be performed in order to determine the exact cause of these variations. In the 2 samples where streptococci were found on the plates, the catalase reading was high and the alcohol reaction was positive. It seems from our experiments that a case of mammitis could be determined at the dairy with these 2 tests without a bacterial count.

"The reduction test agreed in most instances with the bacterial count; that is, whenever the sample was reduced in a short time, the bacterial count was high.

"The fermentation test corresponded in the majority of instances to the kind of bacteria found on the plates. If a large number of *B. subtilis* or *B. mesentericus* were found present on the plates, the curd was usually peptonized or digested to a certain degree.

The acidity and temperature gave some indication of the dilutions that were necessary for a bacterial count. In the samples examined the acidity was fairly high, this probably being due to the age of the milk when received at the laboratory. The age of the milk, so far as could be ascertained, was about 24 hours. The temperature of the milk, as seen by the tables, ranged between 14 and 25° . .

"The biochemic tests used are simple in their technique. The results obtained are practically as good as those shown by plating, so far as estimating the number of bacteria is concerned. Many different affections of the animal, also various pathological conditions of the udder, can be detected by these tests, and they would materially aid a clinical examination. Pathological excretions from the udder can be demonstrated by the biochemic tests, whereas a chemical and bacteriological examination often gives negative results. Further investigations will undoubtedly be necessary to form definite conclusions, but from this brief experiment it is hoped that others may be inspired to engage themselves in similar work. These tests, if applied at the dairy or site of milk production, would greatly aid the health officials in controlling a milk supply."

A bibliography is appended.

Casein media adapted to the bacterial examination of milk, S. H. AYERS (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1911, pp. 225-235*).—This has been noted from another source (*E. S. R.*, 26, p. 576).

A proposed modification of the official method of determining humus, O. C. SMITH (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 1, pp. 35-37).—It was found in the analyses of over 200 soils that if the 4 per cent ammonium hydroxid solution of the soil as obtained by the official method is shaken after digesting for 24 hours, and all soil possible is poured into the filter, a perfectly clear solution is easily and invariably obtained. If the filtering is started in the morning, it may be finished by night.

A comparison was made of this method with the Mooers and Hampton method, and the Rather method (*E. S. R.*, 25, p. 614). Ammonium carbonate gave no such changes in the color of the solution prepared by the Smith method as with the solution in the Rather method. In every case the percentage of ash was larger in the Smith than in the Rather method, but that of humus was nearly the same. It is concluded that if in the Rather method the exact amount of ammonium carbonate solution is not added each time and the other procedures are not alike there will be a difference in the final results.

A simple method for preparing neutral ammonium citrate solution, A. J. PATTEN and W. C. MARTI (*Science, n. ser.*, 37 (1913), No. 957, p. 687).—The method is based on the reaction taking place between formaldehyde and ammonium salts which results in the liberation of the acid and the formation of

hexamethylenetetramin. It depends on the exact determination of the amount of ammonia and anhydrous citric acid present in the solution. The ratio established for the neutral solution is 1:3.765.

Note on the distillation and composition of turpentine oil from the chir resin, P. SINGH (*Indian Forest Rec.*, 4 (1912), No. 1, pp. 1-71).—Among the subjects discussed are the general properties of turpentine oil; methods of turpentine distillation; the chemical composition of turpentine oil from *Pinus longifolia*; the utilization of turpentine residue in the manufacture of printing ink; a new method for the distillation of turpentine oil with acetic acid or methylated spirit; recovery of acetic acid; details of redistillation experiments carried out to improve the quality of the oil obtained by water distillation in 1908; the quality of turpentine oil as required by railways and the Indian Ordnance Department; turpentine substitutes; imports of turpentine oil into India; and the future outlook.

Note on the clarification of Indian rosin, P. SINGH (*Indian Forest Rec.*, 4 (1912), No. 1, pp. 75-89).—The author concludes that the crude resin should be classified in different grades according to its color and quality, which will depend on the season and the number of years over which tapping has been continuously carried out, and that the colophony resulting from the various grades of resin should also be properly graded before sending to the market. Melted rosin as it issues from the still must always be heated over an open fire to drive off the last traces of the oil, and make it harder, less liable to melt in transit, and produce a brighter appearance. In heating colophony over an open fire, it is preferable to add gradually about 5 lbs. of water to a charge of about 82.286 lbs. Dark rosin, while being heated over an open fire should always be treated with crystalline alum and if necessary after clarification exposed to sunlight for further bleaching. Any desired shade of color can be given to colophony by clarifying it with a mixture of alum or niter or both in the desired proportion.

French bibliography concerning sugar and the sugar industry, A. J. SCULIER (*Catalogue des Ouvrages spéciaux de Langue française concernant le Sucre et L'industrie Sucrière*. Paris, 1911, pp. 340).—This is the bibliography of L. S. Ware in regard to sugar and the sugar industry, and deals especially with the literature published in the French language.

METEOROLOGY—WATER.

Climatic areas of the United States as related to plant growth, B. E. LIVINGSTON (*Proc. Amer. Phil. Soc.*, 52 (1913), No. 209, pp. 257-275, pls. 3).—The author strongly emphasizes the need of quantitative studies of the climatic relations of plants but states that "before such quantitative knowledge can be attained it will be necessary that there be made available somewhere a laboratory so equipped that all of the main conditions of plant growth may be controlled and altered at the will of the experimenter," as has been advocated by De Candolle and Abbe (*E. S. R.*, 17, p. 942; 28, p. 705).

The inadequacy of meteorological and climatic methods and data at present available is pointed out. "The weather services of the world are expending vast amounts of wealth and energy in accumulating, year by year, observational statistics bearing upon the various climatic areas. These statistics are largely used for weather prediction and for the purposes of theoretical meteorology. It seems that quantitative climatic descriptions must lie hidden somehow in these enormous masses of figures, but the plant geographer, whether agriculturist or ecologist, has thus far been able to derive therefrom but a very small amount of applicable information."

Using the best available data, the author charts summation zones of the temperature and moisture conditions in the United States during the frostless period. In the case of temperature the method used is similar to that of Merriam. The result represents the summations of average or normal daily temperature above 32° F. for the frostless season. "The temperature summation zones cross the continent in a generally west-east direction, being southwardly displaced in the regions of the two mountain systems and also to some extent along the Pacific seaboard. Practically all of the area of the United States is characterized, according to this chart, by normal temperature summation indices ranging from 3,000 to 13,000. The southern half of the Florida peninsula exhibits still higher indices."

Charting the average normal daily precipitation at 179 different places in the United States, it is shown that the precipitation lines "tend strongly to take a north-south direction, thus crossing [the] isothermal lines and dividing the country into irregular climatic areas each of which might be defined by the use of these two systems of lines." A like result is obtained when the evaporation (for which very inadequate data are available) is similarly charted.

No attempt is made to trace any relation between the distribution of plants and the climatic areas indicated by the charts.

Volcanic dust and other factors in the production of climatic changes and their possible relation to ice ages, W. J. HUMPHREYS (*U. S. Dept. Agr., Bul. Mount Weather Observ.*, 6 (1913), pt. 1, pp. 34, pl. 1, figs. 4; *Jour. Franklin Inst.*, 176 (1913), No. 2, pp. 131-172, pl. 1, figs. 4; *Jour. Wash. Acad. Sci.*, 3 (1913), No. 13, pp. 365-371; *Sci. Amer. Sup.*, 76 (1913), No. 1964, p. 114).—In these papers the conclusion is reached that "volcanic dust in the high atmosphere decreases the intensity of solar radiation in the lower atmosphere and therefore the average temperature of the earth, substantially as theory indicates a priori that it should, and this effect has been clearly traced back to 1750, or to the time of the earliest reliable records. Hence, it is safe to say that such a relation between volcanic dust in the upper atmosphere and average temperatures of the lower atmosphere always has obtained, and therefore that volcanic dust must have been a factor, possibly a very important one, in the production of many, perhaps all, past climatic changes, and that through it, at least in part, the world is yet to know many another climatic change in an irregular but well-nigh endless series—usually slight though always important, but occasionally it may be, as in the past, both profound and disastrous."

Volcanoes and climate, C. G. ABBOT and F. E. FOWLE (*Smithsn. Misc. Collect.*, 60 (1913), No. 29, pp. 24, figs. 3).—Summarizing the results of their studies on this subject, especially in connection with the haze produced by the eruption of Mt. Katmai, the authors conclude that "the transparency of the atmosphere was much reduced in the summer of 1912 by dust from the volcanic eruption of Mt. Katmai, June 6 and 7.

"Evidence of the dust appeared at Bassour, Algeria, on or before June 19, and at Mt. Wilson, California, on or before June 21.

"The total direct radiation of the sun was reduced by nearly or quite 20 per cent at each of these stations when the effect reached its maximum in August.

"In the ultraviolet and visible spectrum the effect was almost uniform for all wave-lengths, but was somewhat less in the infra-red.

"From Bassour experiments, including measurements by 2 methods of the radiation of the sky, it appears that the quantity of heat available to warm the earth was diminished by nearly or quite 10 per cent by the haze. There

is, however, some indication that this was in part counterbalanced by a decrease in the earth's radiation to space, caused by the haze.

"Similar periods of haze followed great volcanic eruptions in former years. The influence of Krakatoa, Bandai-San, Mayon, Santa Maria, and Colima seems to have been recorded by measurements of solar radiation, and caused pronounced decrease in the direct solar beam from 1883 to 1885, 1888 to 1894, and 1902 to 1904.

"Evidence is presented that the dust layer of 1912 affected terrestrial temperatures, especially of high stations.

"A remarkable correspondence is found between the average departures of the mean maximum temperature for 15 stations of the United States and a curve representing a combination of the sun-spot numbers of Wolfer and the departures from mean values of the annual march of direct solar radiation from 1883 to 1909."

Do volcanic explosions affect our climate? C. G. ABBOT (*Nat. Geogr. Mag.*, 24 (1913), No. 2, pp. 181-198, figs. 10).—From observations by means of the Langley bolometer the author concludes "that volcanic haze has very appreciably influenced the march of temperature in the United States." He believes that "it will be found eventually that temperatures are influenced perhaps as much as several degrees by great periods of haziness, such as those produced by the volcanoes of 1883, 1888, and 1912," viz, the eruptions of Krakatoa, Island of Vulcano, and Katmai.

Evaporation in the Great Plains and mountain districts as influenced by the haze of 1912, L. J. BRIGGS and J. O. BELZ (*Jour. Wash. Acad. Sci.*, 3 (1913), No. 14, pp. 381-386).—Observations at 15 places on the Great Plains and intermountain regions are recorded which indicated that the average evaporation of these places "was below normal during the 4 months following the eruption of Mt. Katmai, the average reduction in evaporation being about 10 per cent."

Bulletin of the Mount Weather Observatory (*U. S. Dept. Agr., Bul. Mount Weather Observ.*, 5 (1913), pt. 6, pp. 365-419, figs. 36).—This number contains the following articles: The Wolf-Wolfer System of Relative Sun-spot Numbers for the Years 1901-1912, by A. Wolfer; Certain Characteristics of Easterly Winds at Blue Hill Observatory, by A. H. Palmer; and Free-air Data at Mount Weather, Va., for October, November, December, 1912 (illus.), by W. R. Blair.

Monthly Weather Review (*Mo. Weather Rev.*, 41 (1913), Nos. 5, pp. 663-814, pls. 10; 6, pp. 815-966, pls. 9).—In addition to the usual climatological summaries, lake levels, weather forecasts and warnings for May and June, 1913, river and flood observations, lists of additions to the Weather Bureau library and of recent papers on meteorology, a condensed climatological summary, and climatological tables and charts, these numbers contain the following special papers.

No. 5.—Severe Hailstorm on James Island, S. C., by J. H. Scott; Snow Survey of Big Cottonwood Watershed, by H. K. Burton and W. A. Richmond; Snow Survey on Pole Creek Watershed, Sanpete County, Utah, by B. F. Eliason; Notes on the Rivers of the Sacramento and Lower San Joaquin Watersheds, by N. R. Taylor; Notes on Streams of the Upper San Joaquin Watershed, by W. E. Bonnett; and The Sun as a Fog Producer, by A. G. McAdie.

No. 6.—Severe Wind and Hail Storms in Florida, by A. J. Mitchell; Probable Cause of the Electric Storms in Western Kansas, by S. D. Flora; Torrential Rainfall at Montell, Tex., by B. Bunnemeyer; Notes on the Rivers of the Sacramento and Lower San Joaquin Watersheds during the Month of June, 1913, by N. R. Taylor; Notes on Streams of the Upper San Joaquin Watershed, by J. H.

Gordon; Relative Humidity in Death Valley, by A. G. McAdie; and Tornado in Western Montana, by R. F. Young.

Meteorological reports, C. C. GEORGESON (*Alaska Stas. Rpt. 1912, pp. 89-96*).—This is a summary in the usual form of observations on temperature, precipitation, and weather conditions at the different Weather Bureau stations in Alaska.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and E. K. DEXTER (*Massachusetts Sta. Met. Buls. 295, 296, pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during July and August, 1913, are given. The data are briefly discussed in general notes on the weather of each month.

Meteorological record (*New Hampshire Sta. Bul. 163, pp. 39-64*).—Summaries are given of daily observations at Durham, N. H., on temperature, precipitation, direction of the wind, and cloudiness for each month from July, 1910, to June, 1912, inclusive, as well as a summary by months for the period from July, 1895, to June, 1912, inclusive. The average annual temperature for that period was 45.4° F., the rainfall 40.76 in., the number of rainy days 98, the depth of snowfall 55.4 in.

Ohio weather in 1911, J. W. SMITH and C. A. PATTON (*Ohio Sta. Bul. 249, pp. 805-898, figs. 72*).—The temperature and precipitation throughout the State during each month is shown in 72 charts. The usual summary tables show temperature and rainfall at Wooster and throughout the State (1888-1911). For the first time tables of rainfall at the district test farms at Strongsville, Germantown, and Carpenter are included in this summary.

The mean temperature for the year at Wooster was 50.8° F., for the State 52.6°; the highest temperature at the station was 101°, July 4, for the State 107°, July 4; the lowest temperature at the station was -11°, January 4, for the State -19°, January 4. The annual rainfall at the station was 47.15 in., for the State 42.65 in. The number of rainy days at the station was 142, for the State 127. The prevailing direction of the wind was northwest at the station and southwest for the State.

The water resources of the coastal plain of North Carolina, L. W. STEPHENSON and B. L. JOHNSON (*N. C. Geol. and Econ. Survey [Rpt.], 3 (1912), pp. 333-483, pls. 14, figs. 5*).—This is an extended discussion by counties of the character of the surface and underground water supplies of this region, taking up in considerable detail the question of artesian water. Analyses of many of the principal waters accompany the report.

Water (*Bien. Rpt. Utah Conserv. Com., 1 (1913), pp. 106-131, pls. 6*).—This calls attention to the extent of irrigable land in Utah and reports on Carey Act and private irrigation projects, and on the available ground and run-off water.

Farm water supplies, with special reference to dairy farms, S. C. PRESCOTT (*Amer. Jour. Pub. Health, 3 (1913), No. 9, pp. 892-902*).—Attention is directed to the many sources of pollution of rural water supplies, especially surface and shallow supplies, and a brief review is given of chemical and bacteriological methods of analysis. Of 202 water supplies examined by the author from dairy farms in a region "rather superior hygienically to rural districts of most of the country" 29 were badly polluted and 10 gave evidence of immediate danger of contamination. Various means of reducing the chances of infection of farm water supplies are discussed.

SOILS—FERTILIZERS.

Amino acids and acid amids as sources of ammonia in soils, S. L. JODINI ET AL. (*Iowa Sta. Research Bul. 9, pp. 327-362*).—In investigations previously reported (*E. S. R.*, 26, p. 615) the author reached the conclusion that "decomposition of protein bodies contained in soil organic matter can be accomplished through bacterial activity, the agency of enzymes, or even by purely chemical means; . . . that it would be most natural to assume that the disintegration of proteins in the soil is primarily protein hydrolysis, that is to say, that the proteins present in the soil are gradually broken up to albumoses, peptones, acid amids, and amino acids. The latter are the organic nitrogenous compounds out of which ammonia is formed in order to be oxidized further to nitrites and nitrates. The cycle of the nitrogen in the soil is, then, the reverse of what it is in the plants. . . .

"Inasmuch as . . . the bulk of the acid-soluble nitrogen in the soil is made up of acid amids and amino acids, which are the organic substances immediately preceding the ammonia production, it is at once evident that direct experiments having as their object to throw light upon the behavior of amino acids in the soil are of considerable interest to agricultural science as well as to practical agriculture."

The production of ammonia by various amino acids and acid amids, including glyocol, leucin, phenylalanin, asparagin, aspartic acid, glutamic acid, tyrosin, alanin, cadaverin, acetamid, and propionamid, was studied by mixing the substances with soil, allowing to stand at room temperature, and determining the ammonia at the end of periods of from 2 to 10 days by distillation with magnesium oxid or barium carbonate.

The results were not conclusive, especially as to whether amino acids and acid amids can be quantitatively deaminized in the soil. "It is possible that while the ammonification of the amino acids and acid amids is still going on in the soil, a portion of the ammonia produced is oxidized to nitrites and nitrates. Loss of nitrogen through denitrification, as well as loss of ammonia escaping from the soil, as gas, in case its ammonia-holding capacity is limited, is also not out of the question. Bacteriological factors, as well as other conditions, will also have to be taken into consideration. However, the data at hand permit of drawing the following conclusions:

"(1) The amino acids and acid amids examined readily undergo in the soil the process of ammonification. (2) All other things being equal, the rate of transformation of the amino acid and acid amid nitrogen into ammonia is greatly influenced by their chemical structure so that amino acids and acid amids of equal structure yield about the same proportion of ammonia and vice versa."

On the probable value to *Bacillus coli* of "slime" formation in soils, C. REVIS (*Proc. Roy. Soc. [London], Ser. B, 86 (1913), No. B 558, pp. 371, 372*).—Culture experiments with soil showed that "in all the flasks which contained *Bacillus coli*, not only did the flasks retain their moisture for 3 years, but during the first 12 months of the experiment had evidently taken up large quantities of moisture from the atmosphere, and in one or two instances the soil became completely water-logged. It seems evident that this extraordinary behavior is connected with the *B. coli* and . . . it seems reasonable to attribute the water absorption of the soil to this curious property. These results possibly give at the same time some explanation of the well-known power of many organisms which occur in soil, especially the 'nodule' bacteria, to form 'slime.'"

Studies on the relation of the nonavailable water of the soil to the hygroscopic coefficient, F. J. ALWAY (*Nebraska Sta. Research Bul. 3*, pp. 5-122, figs. 37).—In the studies reported "water-tight cylinders, 6 ft. long and holding about 100 lbs. of soil, were either filled with dry soil, saturated with water and drained before sealing at the bottom, or filled with soil already containing the desired amount of moisture. These were removed to a greenhouse, seeds of wheat, milo maize, beans, or maize planted in the moist surface soil and no more water added, the resulting plants being allowed to grow until they matured normally or died. Upon the death of all the plants in a cylinder it was opened, both the total and the free water in each 3-in. section of soil determined, and the distribution of roots observed. In other cylinders three perennial desert legumes were grown until they died or were near their limit of endurance, then the cylinders were opened and the moisture content and root distribution determined.

"In all the cylinders bearing plants, a hard crust developed below the surface mulch of dry soil, but it seemed to have no injurious effect. The formation of such a crust is to be regarded as unavoidable where during a prolonged period of rainless weather plants with a well developed root system and a very limited amount of moisture in the subsoil are transpiring a large amount of water.

"In their ability to exhaust the moisture of the subsoil before dying, Red Fife wheat, Kubanka wheat, milo maize, Mexican beans, and maize showed little difference, but in their ability to continue alive after first showing serious injury from drought they exhibited marked differences. The interval between wilting and death in the case of the beans amounted to only a few days, but in that of wheat and milo maize it often extended to many weeks. Where there was a well developed root system and no remarkably unfavorable conditions occurred before the death of the plants, the moisture content could be reduced by any of these plants almost to the hygroscopic coefficient.

"In experiments with perennial desert legumes the plants remained alive after the water content had fallen slightly, but distinctly, below the hygroscopic coefficient, even to the point at which all the above mentioned annual crop plants had died. Under favorable conditions these legumes adjusted themselves to the gradually increasing dryness of the soil by dropping their leaves one by one; but where, with the subsoil moisture already reduced to near the hygroscopic coefficient, conditions causing an abnormally high transpiration suddenly set in, death occurred without the leaves having dropped. While the experiments furnish no evidence of any ability on the part of these legumes to utilize for growth the last portion of free water, they indicate that this portion has a very high value for the maintenance of life and that even some of the water below the hygroscopic coefficient may be available for the maintenance of life in these plants.

"In the portions of a semiarid subsoil where roots are well developed the final content of free water is independent of the distance from the surface, except where the stored water is much in excess of the amount required for the complete maturity of the plant.

"When the portion of the subsoil in immediate contact with the roots contains only a comparatively small amount of free water, crop plants may die quickly if conditions are such as to cause an unusually rapid transpiration. An abundance of free water in deeper portions of the subsoil, in which but few roots have been developed, may not avail to carry the plant over such a critical period.

"The economy in the use of a certain amount of free water stored in the subsoil may be much affected by its distribution. A high content confined to the portion of the soil near the surface may induce a rapid growth of the

plants and an economical use of the water in so far as the production of foliage alone is concerned, but the resulting large transpiring surface may cause the death of the plants before they reach maturity. The same amount of free water distributed through a greater depth may induce a slower growth, allow a longer lease of life, and so permit of the production of seed, while if the same amount be distributed through a still greater depth the content of free water may everywhere be too low to permit of the development of roots, thus rendering the free water nonavailable.

"The loss of water from the subsoil of dry lands under crop seems to take place almost entirely through transpiration. In the absence of plants the loss from the subsoil is small. The stored moisture of the different depths of subsoil in the field becomes available to the plants by the roots being developed to these depths, but little moisture being elevated to the roots by capillarity. However, in the case of subsoils saturated in cylinders or pots and comparable to such field subsoils as are only a few feet above the water table, the content of free water is so high that large amounts of moisture may be elevated to the roots by capillarity. The amount of water retained by a soil saturated in pots or cylinders is far in excess of the amount retained by a similar soil saturated in a field where the water table is at a considerable depth below the surface, as in ordinary dry land soils.

"To obtain a basis for comparing the available moisture in soils, either the hygroscopic coefficient or the wilting coefficient may be used. In general the one may prove as satisfactory as the other, but in considering the germination of seeds and the development of roots, and hence the whole of the earlier portion of the life of annual crop plants, the wilting coefficient appears the preferable; while in considering the production of seed in the case of annual crop plants and the maintenance of life and even the growth of perennial plants, the hygroscopic coefficient appears much the preferable.

"In the case of ordinary dry land soils, the water table being at a considerable depth below the surface, the maximum amount of soil water available to plants, for growth and for the maintenance of life, is approximately equal to the free water—the difference between the total water and the hygroscopic coefficient—in those portions of the soil and the subsoil occupied by the roots. For some plants the available water appears to be somewhat greater and for others somewhat less than the free water."

Investigations on moisture and soil types in Sulphur Spring Valley. R. W. CLOTHIER (*Arizona Sta. Bul. 70, pp. 736-776, pls. 2, figs. 2*).—Rainfall records of the valley are said to indicate that a little less than two-thirds of the annual rainfall occurs during the growing season and a little more than one-third during the winter. The summer rainfall is always local in character, sometimes torrential, but frequently falls in light showers. The author believes that no rain less than $\frac{1}{4}$ in. is retained by the soil except possibly by the most sandy soils, but that small showers of $\frac{1}{4}$ in. or more are effective if they fall at intervals of not more than 2 days.

Attempts were made to conserve the rainfall in the soil by deep plowing, intertillage of crops, and by fallowing the land and harrowing or disking it after every rain. During the 3 years' experiments the winter rainfall was much below normal, but in 1909 the summer rainfall was normal and in 1910 and 1911 above normal. The total amount of rain penetrating the soil during the 3-year period is estimated at 29.97 in. It was found impossible to save any considerable amount of the natural rainfall from one summer's rainy season to the next by the methods of tillage used. The moisture determinations at the close of each season showed an accumulation of several inches of water in the

upper 4 ft. of soil, but this was all lost in most cases before the beginning of the next rainy season.

Where water was applied in larger amounts than afforded by the natural rainfall as by flooding, by run-off, or by supplemental irrigation, there was some moisture saved in the subsoil until the next year. This occurred especially in the lighter soil underlaid by a heavier soil at a depth of about 4 ft. The author suggests as one of the reasons of failure to conserve moisture by these methods the great daily range of temperature which prevails throughout the year in southern Arizona where there is often a difference of 60° between day and night temperature. Such conditions are said to destroy the protecting effect of a dust mulch.

Investigations of soil moisture conditions in light and heavy soils show that much rainfall was lost by run-off in heavy soils, since water penetrated them very slowly and although they were found to have a great absorptive power the water was held relatively near the surface causing evaporation losses. Light soils allowed quick penetration to such depths that comparatively little water was lost by run-off, but the rapid capillary movement in light soils is said to account for the loss of a considerable part of the rain water.

[Effect of ashes from Mt. Katmai on Alaskan soils], C. C. GEORGESON (*Alaska Stas. Rpt. 1912, pp. 40-42, 67-71, pls. 2*).—The soil of Kodiak Island, Alaska, was covered to an average depth of 18 in. with ashes from Mt. Katmai 90 miles away during the eruption of June 6 and 7, 1912. These ashes were of 3 grades, (1) a fine rather heavy gray sand, (2) a yellow deposit not unlike yellow clay dust, and (3) an exceedingly fine gray powder which had evidently been blown to great heights and which continued to settle through the atmosphere for days.

"The ashes had no poisonous or deleterious effect upon plants beyond that of smothering them. This point established, it did not seem improbable that the station land could be rehabilitated by seeding the proper grasses and legumes. To ascertain how grains and grasses would behave in the ashes, small areas were seeded in July to wheat, rye, barley, and oats. Small patches were also seeded to various cultivated grasses and clovers. Part of the seeded patches were fertilized with stable manure and part were seeded on the bare ashes. The seeds germinated, but the growth was very slow in all cases. On the bare ashes the grasses and grains did very poorly. The plants remained alive, but their growth was stunted. Evidently the ashes were wholly destitute of nitrogen. Where the manure was worked into the surface of the ashes, on the other hand, the growth was almost normal, indicating that fertilizers were needed."

The beneficial results from a top-dressing of sodium nitrate very clearly indicated the need of nitrogen. "It was further observed that when a layer of the ashes was worked in with the original top soil the growth of vegetables and grains was, if anything, better than when grown in the soil without any ashes."

"From the observations made during the season and the tests carried out, it is reasonable to believe that, with sufficient manure or sodium nitrate to nourish the plants until their roots grow down into the soil below the ashes, grasses and grains can be grown successfully. Where the ashes settle or pack down enough to allow the mixing of ash and soil below by means of a plow, the growing of crops is assured."

Soil fertility, J. W. NEAL (*Alaska Stas. Rpt. 1912, pp. 48-50, pl. 1*).—The soil around the Fairbanks Station, on which the experiments here reported were made, is described as a silty clay deficient in humus and available plant food in the hilly and upland regions except where the land is timbered and a large amount of vegetation has decomposed and been incorporated with the soil. The conditions are generally such that the primary need is for available plant

food in the surface soil. An application of 150 lbs. per acre of sodium nitrate to wheat, barley, and oats more than doubled the yield of these crops. Application of sodium nitrate (200 lbs. per acre) also greatly increased the yield of potatoes.

La Salle County soils, C. G. HOPKINS ET AL. (*Illinois Sta. Soil Rpt. 5, pp. 45, pls. 4, figs. 5*).—This is the fifth of the series of the Illinois county soil reports and, as in other reports of the series, deals briefly with physiography, topography, and formation of the soils, and more fully with soil material and soil types, chemical composition of the soils, and field tests of the fertilizer requirements of certain of the soils (in this case the brown silt loam).

"La Salle County is located in the north central part of the early Wisconsin glaciation. The soils of the county are divided into five classes as follows:

"(1) Upland prairie soils, rich in organic matter. These were originally covered with the wild prairie grasses, the partially decayed roots of which have been the source of the organic matter. The flat prairie land contains the higher amount of this constituent because it was largely preserved from decay by the presence of water.

"(2) Upland timber soils, including those zones along stream courses over which forests once extended. The timber land contains much less organic matter, because the large roots of dead trees and the surface layer of leaves, twigs, and fallen trees were burned by forest fires or suffered almost complete decay.

"(3) Terrace soils, or second bottom land, representing the soils formed on fills of either silt or gravel or the flood plain of a stream when it flowed at a higher level than at present.

"(4) Swamp and bottom lands, which include the lands that overflow along streams and a few small areas of swamps on the upland.

"(5) Residual soils, formed by the decomposition of rocks in place. The entire area of this class is only $2\frac{1}{2}$ square-miles."

"The most significant fact revealed by the investigation of the La Salle County soils is the low phosphorus content of the common brown silt loam prairie, a type of soil which covers more than three-fourths of the entire county. . . .

"With 6,000 lbs. of nitrogen in the soil and an inexhaustible supply in the air, with 34,000 lbs. of potassium in the same soil and with practically no acidity, the economic loss in farming such land with only 1,300 lbs. of total phosphorus in the plowed soil can be appreciated only by the man who fully realizes that the crop yields could ultimately be doubled by adding phosphorus, without change of seed or season and with very little more work than is now devoted to the fields."

The selection of soils in the Tropics, F. WOHLTMANN (*Jahrb. Deut. Landw. Gesell.*, 28 (1913), No. 1, pp. 246-262; *abs. in Rev. Sci. [Paris]*, 51 (1913), II, No. 10, pp. 311, 312).—It is shown that the success of the settler in the Tropics is especially dependent upon the judgment he exercises in selecting his soil. It is necessary for this purpose to know the climatic and geological conditions under which the soils were formed, their character at different depths, mechanical and chemical composition, and bacteriological properties. Chemical analyses of a Kamerun soil at different depths are given and the kinds of soil adapted to various tropical crops, including cacao, coffee, muskat nut, vanilla, sisal, cotton, jute, caoutchouc, peanuts, coconut, date, oil and sago palms, tubers of various kinds, bananas, corn, millet, and tobacco are described.

Malayan soils, M. BARROWCLIFF (*Agr. Bul. Fed. Malay States*, 1 (1913), Nos. 6, pp. 210-216; 12, pp. 418-428).—Mechanical and chemical analyses of

different kinds of Malayan soils are reported and discussed with reference to plant-food content and fertilizer requirements.

The results show that the soils are as a rule rich in humus and nitrogen and almost totally lacking in lime. They have a high clay content and are consequently abundantly supplied with potash, which, however, is not very available. The phosphorus content is variable. Correlating the yields with the chemical analyses, it appears that available phosphate is, as a rule, the controlling element of fertility, especially in the paddy soils.

Analyses of soils, B. C. ASTON (*Jour. Agr. [New Zeal.]*, 6 (1913), No. 5, pp. 508, 509).—Chemical analyses of 32 samples of typical soils used in cooperative experiments in different parts of New Zealand are reported. Both total and available potash and phosphoric acid are given. The larger proportion of the soils was found to be acid. Some of them were well supplied with plant food, others were very deficient in this respect. In 13 of the soils the magnesia exceeded the lime.

A report of progress in soil fertility investigations, J. G. HUTTON (*South Dakota Sta. Bul.* 145, pp. 235–263, figs. 2).—The field experiments reported upon in this bulletin have been carried on at the central station at Brookings and at the Highmore, Eureka, and Cottonwood substations. The experiments are being conducted on tenth-acre plats treated as follows: "The first plat receives no plant food, the second receives nitrogen only, the third receives phosphorus only, the fourth receives potassium only, the fifth receives no plant food, the sixth receives nitrogen and phosphorus, the seventh receives nitrogen and potassium, the eighth receives phosphorus and potassium, the ninth receives nitrogen and phosphorus and potassium, the tenth receives no plant food." The treatment otherwise is the same for all plats. Five years' results with two rotations, (1) corn, oats, wheat, barley, and clover, and (2) corn, wheat, barley, oats, and clover, at Brookings are summarized.

The results indicate that phosphorus is the limiting element of plant food in the Brookings soil. The average value of the crops during five years on this soil "was greater where phosphorus alone was applied than where any other element of plant food was applied or where any combination of elements of plant food was applied." It was 31.1 per cent greater where phosphorus alone was applied than where no phosphorus was used.

Increasing crop yields in Ohio (*Ohio Sta. Circ.* 138, pp. 135–137).—This circular summarizes the results of experiments with fertilizers and manure on crops grown in rotation during a period of 20 years on thin, somewhat sandy, yellow clay upland of the station farm and for shorter periods on soils in other parts of the State.

The results show that the yields of corn, wheat, hay, and oats can be increased to about twice that of the averages for Ohio by means which will be abundantly reimbursed in each year's crops. Such results were obtained on a 40-acre tract of land by applying manure, reenforced with acid phosphate or raw rock phosphate, directly from the stables to the clover sod to be turned under for corn, the oats following receiving no treatment, but wheat following the oats receiving a complete fertilizer made up of about 200 lbs. steamed bone meal, 100 lbs. acid phosphate, and 40 lbs. muriate of potash in the fall, followed by 60 lbs. nitrate of soda in the spring. The phosphate was dusted on the manure in the stables at the rate of 1 lb. per 1,000 lbs. of live weight of animals per day. The wheat was followed by clover, completing the rotation.

Alpine fertilizer experiments in Carinthia, 1910–1912, H. SVOBODA (*Ztschr. Landw. Versuchsw. Österr.*, 16 (1913), No. 7, pp. 745–789).—The results of numerous cooperative experiments on alpine pastures and grass lands are reported, the results of which are largely of special or local interest.

In general the combined use of manure and commercial fertilizers gave the best results both as regards immediate and after effects. The commercial fertilizers showed a decidedly longer after effect than manure, being apparent for 5 years while the effect of manure was not perceptible after 3 years. The use of high-grade fertilizers is advised because in this case the cost of transportation is reduced.

Studies in Japanese agriculture.—I, Fertilizers, J. STRUTHERS (*Trans. Asiatic Soc. Japan*, 41 (1913), pt. 2, pp. 351-377).—This is the first of a proposed series of articles on Japanese agriculture.

It is shown that the use of commercial fertilizers in Japan is of comparatively recent date, but is rapidly assuming large proportions. The estimated total value of fertilizers now used is from \$34,860,000 to \$39,840,000 annually. The use of commercial fertilizers is supplementing, and to a considerable extent, superseding the older practices depending upon the use of night soil, straw ashes, and similar fertilizing materials. The use of animal manures has played a comparatively insignificant part in Japanese agriculture because the number of animals is small and the manure is usually poor in fertilizing constituents. Green manuring, especially with green grass, *Astragalus sinensis* and *Medicago denticulata*, is practiced to some extent. Japanese soils are not naturally very fertile and the system of continuous cropping which prevails is very exhausting to the land, hence the free use of fertilizers has been followed with very profitable results.

The imports of fertilizing materials into Japan are large and include all of the usual fertilizing materials, mixed and unmixed, besides a variety of oil cakes and miscellaneous materials. German potash salts have only recently been introduced and their use is still limited chiefly to a small amount of sulphate of potash. The home-produced fertilizers include various kinds of oil cakes and fish manures, bone, hoofs, horn, hair, rice bran, by-products from the soy, the sake, the beer, and other industries, wastes from silkworm rearing and cocoons, a little sulphate of ammonia from gas works, a small amount of calcium cyanamid, besides superphosphates and mixed fertilizers of different kinds. The principal centers of fertilizer manufacture are Tokio and Osaka.

The Osaka fertilizers were originally made largely for use in aquatic agriculture (rice and rushes) and were compounded chiefly of ammonium sulphate and superphosphate, a mixture which seems to be best suited to soils in which the transformation of nitrogen does not, as a rule, go beyond the ammonia stage and which "does not have the same ultimate acid effect as would the same combination of manures applied to dry land crops. . . . Partly from geological reasons and partly from manuring practices long continued, most soils in Japan have a tendency to become acid and this is more marked . . . in the case of nonirrigated fields. . . . In the manuring of rice Japan is very far in advance of any other rice-growing country, in the manuring of mulberry Japan has no equal, in the manuring of tea she is behind Ceylon and in advance of China, and in the manuring of sugar cane considerably behind Hawaii and in advance of the Philippines. Only within recent years has the manuring of the winter cereals, barley and wheat, received serious attention."

Average analyses of the principal fertilizing materials used in Japan are given.

Importation of fertilizers, B. C. ASTON (*Jour. Agr. [New Zeal.]*, 6 (1913), No. 6, pp. 598-602).—The total imports of fertilizers into New Zealand during the year ended March 31, 1913, was 100,601 long tons as compared with 94,296 tons the preceding year. The larger proportion of these imports was phosphatic fertilizers (see below). Of nitrogenous fertilizers only 969 tons (partly used as fertilizers), and of potassic fertilizers only 4,248 tons were imported.

Phosphates: Their importance to New Zealand farmers, B. C. ASTON (*Jour. Agr. [New Zeal.]*, 7 (1913), Nos. 1, pp. 1-9, fig. 1; 2, pp. 115-126, figs. 3).—It is pointed out that phosphorus is probably the principal element of plant food needed in New Zealand soils. Of analyses of 488 samples of these soils classified in this article 11 showed a deficiency in available potash, 26 a deficiency in nitrogen, and 165 a deficiency in available phosphoric acid. The response of the soils to phosphatic fertilizers clearly indicates the same need, and this is also reflected in the imports of fertilizers in which phosphates very largely predominate.

There was imported into New Zealand for fertilizing purposes during the year ended March 31, 1913, 9,281 long tons of bone dust, 32,964 tons of superphosphate, 20,133 tons of basic slag, and 25,033 tons of guano and rock phosphate. The Otago phosphate mines of New Zealand yielded about 8,000 tons. Potassic and nitrogenous fertilizers are imported to a comparatively small extent.

The author recommends for New Zealand the system of fertilizing advocated by Hopkins, and methods of experimenting with phosphates are described.

Progress in the fixation of atmospheric nitrogen, T. C. PINKERTON (*Amer. Fert.*, 39 (1913), No. 7, pp. 70, 72, 76).—Progress in the manufacture of calcium cyanamid; calcium, sodium, and ammonium nitrates; synthetic ammonia; and aluminum nitrid, using the free nitrogen of the air, is reviewed.

It is estimated that the world's production of cyanamid in 1913 will be 225,000 tons, used principally in the United States 48,000 tons, Norway and Sweden 60,000 tons, Germany 40,000 tons, Italy 30,000 tons, Switzerland 10,000 tons, France 7,500 tons, and Japan 7,500 tons. Its use in mixed fertilizers is increasing. Calcium nitrate is made principally at Notodden, Norway, where sodium and ammonium nitrates are also made. The preparation of the latter is the latest important development in the manufacture of synthetic nitrogen compounds for fertilizing purposes. These nitrates are all now on the market. A factory is being erected for the production of synthetic ammonia. The aluminum nitrid process has been perfected but not tested on a large scale. It yields both ammonia and alumina. Its profitable operation depends in large measure upon the price which can be obtained for the alumina.

The partial sterilization of the soil by means of caustic lime, H. B. HUTCHINSON (*Jour. Agr. Sci. [England]*, 5 (1913), No. 3, pp. 320-330, pl. 1; *abs. in Jour. Soc. Chem. Indus.*, 32 (1913), No. 14, p. 761).—"The known actions of lime in improving the physical condition of a soil, neutralizing acidity, and rendering plant foods available by chemical action are not sufficient to account for many of the results obtained in practice by the application of lime. It is now shown that caustic lime in sufficiently large quantities produces effects intermediate in character between those produced by volatile antiseptics and those induced by high temperatures. The larger protozoa and many bacteria are killed, and the organic nitrogenous constituents of the soil are decomposed. When all the lime has been converted into carbonate, a period of active bacterial growth ensues, with increased production of plant food. Pot experiments gave results in agreement with those of bacteriological and chemical analyses. A poor arable soil, containing a sufficiency of calcium carbonate, gave increased yields after application of 0.5 per cent of caustic lime. A rich garden soil after the application of lime (up to 1 per cent) gave decreased yields in the first crop, but largely increased yields in the second crop."

The lime-magnesia ratio in agriculture, P. LARUE (*Rev. Sci. [Paris]*, 51 (1913), II, No. 2, pp. 48-50).—Investigations on this subject are reviewed and the practical significance of the lime-magnesia ratio from the standpoint of fertilizing the soil is briefly considered.

Tests of radio-active substances, F. BERTHAULT, L. BRÉTIGNIÈRE, and P. BERTHAULT (*Ann. École Nat. Agr. Grignon*, 3 (1912), pp. 1-62; *abst. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 8, pp. 1202-1204).—In culture experiments in which uranium oxid was added to the normal nutrient solutions at varying rates from 0.05 to 1 per cent it was found that the yield of beans was increased by the addition of the oxid in all amounts used. The oxid, however, did not increase the yield of barley and proved positively injurious to maize. In a series of plat tests of a so-called radio-active fertilizer on a great variety of crops only inconclusive results were obtained. The material used showed little or no radio-active power, but it contained a considerable amount of phosphoric acid which the experiments showed was in no way comparable with superphosphate in effectiveness.

Night soil (*Rev. Chim. Indus.*, 24 (1913), No. 285, pp. 227, 228).—Various preservatives and disinfecting preparations for use with night soil are described, and their effect upon the fertilizing value of the substance is discussed.

The use of commercial fertilizers in pond culture, T. FOITIK (*Monatsh. Landw.*, 6 (1913), No. 8, pp. 241-250).—The comparative economy of fertilizing the pond and directly feeding the fish was studied in these experiments.

Pond fertilizing experiments, E. NEERESHEIMER (*Monatsh. Landw.*, 6 (1913), No. 8, pp. 225-238).—No such marked beneficial results from applying fertilizers to fish ponds were obtained as are reported by Kuhnert (*E. S. R.*, 26, p. 811).

Analyses of commercial fertilizers, H. M. STACKHOUSE, R. N. BRACKETT, ET AL. (*South Carolina Sta. Bul.* 172, pp. 77).—This bulletin contains analyses and valuations of 1,922 samples of commercial fertilizers inspected during the season of 1912-13, accompanied by the usual explanatory notes.

Commercial fertilizers, J. L. HILLS ET AL. (*Vermont Sta. Bul.* 173, pp. 219-274).—This bulletin reports analyses and valuations of samples representing 177 brands of fertilizers collected in Vermont during the spring of 1913 with the usual notes and explanations. These brands represented the output of 19 companies. "Eighty-six per cent of the brands met their guaranties. Three brands failed to afford a commercial equivalent of the promises made for them. . . . The quality of the crude stock used in furnishing phosphoric acid and potash, and almost always of organic nitrogen, seemed to be beyond reproach."

Commercial fertilizers: Inspection 1912, B. H. HITE and F. B. KUNST (*West Virginia Sta. Insp. Bul.* 1, pp. 37).—This bulletin reports actual and guaranteed analyses of commercial fertilizers inspected during the year 1912. Those fertilizers in which the sum total of the available phosphoric acid, the ammonia, and the potash claimed falls below 12 per cent are designated low grade. Those running as high as 14 per cent are marked high grade. The inadvisability of using low-grade fertilizers is strongly emphasized.

AGRICULTURAL BOTANY.

Studies on temperatures in relation to seeds and seedlings of wheat, GERTRUD MÜLLER (*Ztschr. Pflanzenkrank.*, 23 (1913), No. 4, pp. 193-198).—The author gives the tabulated results as to capacity for germination and growth obtained by her from numerous treatments of seed wheat by combining through considerable ranges the factors of temperature, moisture, and time. Dried grain kept at 71 to 73° C. for 1 hour lost only 6 per cent of its germinability, while that kept at 60° for 15 hours germinated better than did the control seed.

On various methods for determining osmotic pressures, A. C. HALKET (*New Phytol.*, 12 (1913), No. 4-5, pp. 164-176, figs. 2).—The author reviews different methods of determining osmotic pressure, particularly the plasmolytic method, direct and indirect determinations, physiological methods, and the determination

by means of freezing point of sap; after which he describes Barger's method of determining molecular weights and its application to the estimation of osmotic pressures of the cell sap of plants. Various species were studied by this method and the author claims twofold advantages for it. A very small quantity of sap is sufficient for making the determination so that the osmotic pressure of any small part of a plant may be estimated, and no elaborate apparatus is required. There are, however, some disadvantages, as considerable time must elapse between the readings, the tubes require to be filled with great care, and the method does not allow for any chemical changes that might alter the osmotic strength of the sap.

Studies were made with *Salicornia* by this method and the cryoscopic method and the results obtained varied within similar limits.

Investigations on the nutrition of some of the higher plants in sterile cultures, I. SHULOV (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscow)*, 19 (1913), No. 3, pp. 1-216, pls. 4, figs. 16).—A detailed account of investigations the principal results of which have been noted elsewhere (E. S. R., 29, p. 423).

The assimilation of nutriment by yeast cells, M. RUBNER (*Sitzber. K. Preuss. Akad. Wiss.*, 1913, VIII, pp. 232-241).—The author states that the intensity of fermentation by yeast cells is independent of the concentration of the saccharin medium within wide limits. A solution of sugar was rapidly weakened by either living or killed yeast without fermentation but with the development of a certain amount of heat.

In the fermentation of yeast the mass of protoplasm and not the amount of surface appeared to determine the rate of penetration of nutritive material through the cell wall. The rate of absorption of sugar is said to be in close relation to the intensity of the life processes, varying with changes of temperature and being depressed by the addition of alcohol or common salt.

Yeast is said to stand high among those life forms which develop large amounts of energy per unit of mass, its capability in this regard being surpassed only by that of some species of bacteria.

Penetration of different forms of nitrogen into plants; phenomena of adsorption, D. CHOCHAK (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 22, pp. 1696-1701, figs. 2).—In continuance of work previously done in connection with I. Pouget (E. S. R., 27, pp. 823, 826), the author reports on his own experiments with separated and killed young roots of wheat in a nutritive medium.

He states that the roots of vegetables adsorb and fix various forms of mineral and organic nitrogen, this property being due apparently to the presence of certain substances which are not removed by boiling water. The power to adsorb different substances of the same molecular concentration varies with the nature of these substances. It is stated also that for a given form of nitrogen, conditions being equal, the quantity of nitrogen adsorbed is in close relation to the concentration of the substance in the surrounding medium. It is held that this faculty of adsorption may play an important part in the appropriation of nutritive matter by plants.

The absorption of different forms of nitrogen by plants; influence of the medium, D. CHOCHAK (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 23, pp. 1784-1787).—Continuing the above work, the author investigated the influence upon the adsorptive power exerted by living as well as dead roots of wheat and their absorption of nitrogen on the addition of certain salts to the ammonium chlorid nutritive medium.

From these tests it is said that the other salts influence strongly both diffusion into live plants and adsorption by dead ones. It appears also from

tabulated results that the rapidity of diffusion, as observed in the series of different salts, varies in nearly the same ratio as does that of adsorption. The results of various further experiments with different concentrations of other salts in connection with ammonium chlorid are held to show that for each of the former in connection with the latter a point of concentration exists, corresponding to the maximum of adsorption by the roots. These facts are held to explain, at least in part, some good effects on vegetation obtained by using in addition to ordinary fertilizers, such substances as common salt, gypsum, sulphate of manganese, etc., and to indicate the possibility of obtaining larger crop returns by securing better utilization of nitrogen in the nutritive solution.

It is claimed that the absorption of either organic or mineral nitrogen by young plants does not depend immediately and alone upon the living substance, but that it is in part determined by substances contained in the roots; also that, all other conditions being equal, the adsorption and the activity of diffusion are proportional to the concentration within limits. In solutions of equal concentration the adsorptive power or the activity of diffusion is modifiable by changes in the composition of the external medium, and bears a close relation thereto.

Contributions on nitrogen fixation and nutrition of *Bacillus radiculicola*, and on bacterial tests of nitrigen and azotogen, S. HERKE (*Kísérlet. Közlem.*, 16 (1913), No. 3, pp. 311-322, figs. 2).—It is stated that the nitrogen binding capacity of *B. radiculicola* is increased with its greater accessibility to air, accomplished by means of either increase of surface or thinning of the layer of nutritive liquid; also that this capacity is increased by the addition of carbon compounds and removal of the resulting products. Very small proportions, 0.0001 to 0.01 per cent, of iron or manganese accelerate the development of lupine and serradella bacteria. Nitrogen compounds (ammonium sulphate, potassium nitrate, asparagin) favor the growth of nodule bacteria. Calcium carbonate is found to be very injurious to lupine bacteria and less so to those of serradella, but favorable to peas and particularly so to red clover.

B. radiculicola appeared more viable in azotogen than in nitrigen. The azotogen cultures proved to be purer than were those in nitrigen.

On the cross inoculation of the root tubercle bacteria upon the native and the cultivated Leguminosæ, A. J. EWART and N. THOMSON (*Proc. Roy. Soc. Victoria, n. ser.*, 25 (1912), No. 2, pp. 193-200, pl. 1, figs. 2).—Experiments are reported which were conducted to determine whether the bacteria from the root nodules of native Leguminosæ are capable of directly infecting cultivated species, such as alfalfa, peas, clover, beans, vetch, etc. Inoculation material was taken from root tubercles on 5 species of native plants and cross inoculated on 8 cultivated species, the experiment being performed twice during the period from November, 1911, to June, 1912.

Of 80 different lots of plants, only two, both of which were clovers, showed any indication of nodule development. Although no nodules were present on the roots of the other plants in the inoculated series, yet the plants showed better growth and were larger and much stronger. Whether this was due to the root nodule bacteria continuing to live in the soil and fix nitrogen outside of the plants was not determined.

The experiment is believed to confirm the conclusions of Buhlert (E. S. R., 14, p. 1048) regarding the specialization of forms of *Bacillus radiculicola*.

The bacteria of Nebraska soil, J. J. PUTNAM (*Lincoln, Nebr.*, 1913, pp. 54, pls. 5).—This work was undertaken with the idea of ascertaining, if possible, some of the many chemical changes taking place through the action of bacteria indigenous to Nebraska soil, special reference being given to the fixation of

nitrogen, ammonification, denitrification, and reduction of nitrates by soil bacteria.

The number of bacteria per gram of 70 samples of soil was determined by growing the organisms in nutrient agar and Ashby's nutrient medium for the fixation of nitrogen by *Azotobacter*. Studies on the fixation of nitrogen by impure cultures, availability of various compounds effecting nitrogen fixation, ammonification, reduction of nitrates, bacterial content of subsoil, etc., are described. In the study of nitrate reduction 201 species of organisms from various sources were examined and 139 were found to reduce nitrates to nitrites, while the other species did not effect this reduction. In studying the vertical distribution of bacteria, samples were taken of soil and subsoil to a depth of 20 ft. and a constantly diminishing bacterial content was noted until a level of 13 ft. was reached, when a sudden increase in numbers was observed. The reason for this increase is unknown as no visible impervious layer of soil was encountered.

Studies on the action of acids and acid salts upon the development of *Aspergillus niger*, A. KIESEL (*Ann. Inst. Pasteur*, 27 (1913), No. 5, pp. 391-420, figs. 8).—Concluding a fuller discussion of this subject than that previously noted (E. S. R., 27, p. 848), the author gives the following among other conclusions:

The physiological activity of various acids and acid salts upon the development of *A. niger* does not correspond in the majority of cases to their chemical activity. Fatty acids show considerable toxicity, especially those containing much carbon, the molecular structure also apparently being significant in this respect. It appears from several considerations indicated that the differences of toxicity observed in case of some substances tested are due to differences in penetrability of the protoplasmic layer of the cell for various substances, and that the penetration by the body necessary to its toxic effect may be regulated to a certain degree by that layer. In the development of *A. niger* in the presence of various acids the acid content may first increase and later decrease, while for certain acids augmentation is continual, oxalic acid being only one of several noted as forming under such circumstances.

The influence of the medium on the resistance of *Penicillium crustaceum* to toxic substances, A. LE RENARD (*Ann. Sci. Nat. Bot.*, 9. ser., 16 (1912), No. 4-6, pp. 277-336; *abs. in Bot. Centbl.*, 122 (1913), No. 15, pp. 353, 354).—Studying the protective influence exerted by nutritive salts in the culture medium in which a fungus will develop despite the presence of a toxic substance, the author noted the antitoxic effects of a number of nutritive salts employed singly, combined together, or in connection with glucose, the principal ones being the acetates, formates, sulphates, nitrates, and phosphates of potassium, ammonium, and magnesium. The toxic salts used were acetate and sulphate of copper and both the chlorid and nitrate of copper, zinc, nickel, cobalt, mercury, and silver. The fungus was *P. crustaceum*.

The author concludes that the resistance of this fungus to poisons varies according to the nature and concentration of the nutritive medium in which the fungus is developing. The principal rôle in the protection of the fungus from the toxic compound may be played by either the acid or the base in the medium, but the action of the base is generally the greater when high concentrations are employed.

FIELD CROPS.

The technique of field experiments, M. L. MORTENSEN (*Jahresber. Ver. Angew. Bot.*, 9 (1911), pp. 177-187).—The author believes that from 1/200 to 1/1,000 hectare (about 535 sq. ft.) is the proper size of plats, and that the

form should be as nearly quadrangular as possible. Better results have been obtained from small plats repeated often than from larger plats. The number of plats for repetition was from 8 to 10 ordinarily, depending somewhat upon the number of factors to be determined by the experiment. If more than 2 factors are wanted it is usually found advisable to have more than 10 plats. The distribution of the plats should be such as to include all irregularities in soil, etc., in each series. It is recommended that in order to avoid borders on plats the area should be sowed solid, at harvest time the strips cut out and the measured areas harvested.

Summary of [field crops experiments in Alaska], C. C. GEORGESON (*Alaska Stas. Rpt. 1912, pp. 13-16, 28-37, pl. 1*).—The value of the potato as a farm crop under Alaskan climatic and soil conditions is discussed, and tabulated data of yields of about 60 varieties grown at the Sitka Station are given, in which the estimated yields per acre ranged from 279 bu. with Bliss Triumph to 862 bu. with Burpee Superior. The work in progress at the Fairbanks and Rampart stations is noted below.

Report of [field crops] work at the Fairbanks Station, J. W. NEAL (*Alaska Stas. Rpt. 1912, pp. 50-55, pls. 3*).—In grass experiments the use of 150 lbs. of nitrate of soda usually resulted in double the yields, which ranged from 1½ to 2 tons per acre. In cereal tests, wheat yielded from 55 to 60 bu. per acre. It was noted that Red Fife wheat stood 4 ft. tall, Romanow 4½ ft., and Wild Goose 5 ft., and that the yields were from 55 to 60 bu. per acre. Oat yields ranged from 85 to 100 bu. per acre. Beardless barley yielded 50 bu. per acre, and a hull-less variety produced 42 bu. Winter rye survived the winter with a stand of 75 per cent, but not more than 5 per cent of Kharkov wheat lived. Alfalfa, red, white, and alsike clovers, and field peas are reported to have made good growth, but timothy was unsuccessful. Of the 16 varieties of potatoes reported, the following 3 were the best yielders: Butkee, a local product, gave 478 bu., Irish Cobbler 423 bu., and Gold Coin 375 bu. per acre. Based on cooking qualities alone, the following 3 proved best: Early Ohio, Burpee Early, and Extra Early Ohio.

Report of [field crops] work at the Rampart Station, G. W. GASSER (*Alaska Stas. Rpt. 1912, pp. 59-66, pl. 1*).—Successful trials are reported with rye, oats, barley, alfalfa, and potatoes. Wheat did not winter so well as usual. Tables give data and notes on over 30 barley hybrids and 18 varieties of pedigreed oats. The best yielding variety of potatoes was Hamilton Early, producing at the rate of 325.9 bu. per acre.

In fertilizer tests with oats, the only difference discernible was in the plat receiving nitrate of soda alone, which lodged badly. With awnless brome grass only the plats receiving nitrate of soda showed an increase of growth.

Dry farming in the arid Southwest, R. W. CLOTHIER (*Arizona Sta. Bul. 70, pp. 725-798, pls. 5, figs. 2*).—In this bulletin the author gives a brief history of the development of dry-farming methods in the United States, defines the term "dry farming," discusses the technique and development of dry farming in Arizona, and gives results of investigations on moisture and soil types in Sulphur Spring Valley noted on page 725.

In following experiments contradictory results were obtained in yields of various crops, whether the land was cropped continuously, alternated by fallow and cropping, or fallowed 2 years and cropped 1. Experiments in supplemental irrigation showed the practicability of light spring irrigation in order to start crops which will be matured during the rainy season, which in itself is not long enough to grow the crops.

The light soil, with an initial water content of only 7.02 per cent in the first 4 ft., yielded an excellent crop of milo maize, while the heavy soil, with 11.77

per cent, produced only crop failures with corn, sorghum, and beans. The author prefers the light types of soil for dry farming. Trials of winter cereals proved failures, as the fall and winter rains were exhausted before crop maturity, and the dry winds of March, April, and May killed the plants.

Methods and dates for planting dry-farming crops, with special reference to corn, sorghums, and beans, are given. A suggested system of farm practice for Sulphur Spring Valley is described. Milo maize was the best grain crop tested, with tepary beans a close second. Early Amber sorghum was a sure producer of forage even without the use of supplemental water.

[Field crop experiments] (*Nebraska Sta. Rpt. 1912, pp. IX-XI, XII, XIX-XXI*).—This briefly summarizes the work with corn at the central station and substations in cooperation with farmers, with special reference to the adaptation of varieties to the 6 different corn areas into which the State is divided. A close planting method of seed selection as practiced at the station is described. Notes are included on the work at Scottsbluff Substation on rotation of crops, tests of varieties of wheat, oats, barley, corn, and potatoes, and on methods of irrigation of potatoes and cereals.

[Field crop experiments], F. W. TAYLOR (*New Hampshire Sta. Bul. 163, pp. 13-16*).—This notes the improvement made since 1907 in dent and flint varieties of corn by the use of the ear-row method. The results of fertilizer tests on grass land from 1907 to 1912, inclusive, are given in tabular form. The best average yield of hay was 2.39 tons per acre, produced with 200 lbs. nitrate of soda, with 2.38 tons as the second largest yield, produced with 200 lbs. nitrate of soda and 60 lbs. muriate of potash. The average yield from the nonfertilized plats was 1.72 tons per acre.

There are included brief notes on alfalfa experiments, and cooperative experiments with hay and corn.

Report on the operations of the department of agriculture, Punjab, for 1911-12, B. T. GIBSON ET AL. (*Rpt. Dept. Agr. Punjab, 1911-12, pp. 8+LXIII*).—This report gives the results of continued manurial and other experiments with maize, sugar cane, cotton, wheat, and barley (E. S. R., 26, p. 631).

Report on the agricultural stations in the Central Provinces and Berar for the year 1911-12, F. J. PLYMEN ET AL. (*Rpt. Agr. Stas. Cent. Prov. and Berar [India], 1911-12, pp. 156*).—This publication contains the reports of 22 agricultural stations, and gives the status of crop cultivations and work with cereals, legumes, cotton, and other crops.

Agricultural surveys, Yamethin district, A. McKERRAL (*Dept. Agr. Burma Agr. Surveys, 1912, No. 3, pp. 32, pl. 1*).—This publication gives descriptions of soil types and their chemical analyses; methods of cultivation of cereals, legumes, and miscellaneous crops, including cotton, maize, hibiscus, tobacco, peppers, tomatoes, onions, pineapples, cane, and peanuts; and a list of varieties of rice.

Concerning the Vermont hay crop, J. L. HILLS, C. H. JONES, and C. G. WILLIAMSON (*Vermont Sta. Bul. 171, pp. 166-194*).—This discusses hay as Vermont's dominant crop, also grass soils, soil preparation, and the choice of several grasses and clovers, which are described. Methods and mixtures are given for seeding and reseeding meadows, methods presented for combating the common weeds, and directions, with formulas, given for manuring for mowings in connection with seeding either with or without nurse crops.

Report of work on alfalfa at Holly Springs branch experiment station, C. T. AMES (*Mississippi Sta. Circ., 1912, Sept. 1, pp. 4, fig. 1*).—This circular reports the results of 3 trials on a silty soil of restricted area overlying sand and gravel. In 1911 6,525 lbs. of good hay was obtained in 4 cuttings. Lime,

inoculation, barnyard manure, and fall seeding seem to have been essential to success.

Cooperative manurial experiments on lucern, T. G. W. REINICKE (*Agr. Jour. Union So. Africa*, 4 (1912), No. 4, pp. 523-528).—This is a report on alfalfa experiments to determine whether superphosphate alone would continue to give good results, or whether better results would not be obtained with superphosphate and potash or lime, or both; to compare the action of basic slag and the bone manures with that of superphosphate, and to ascertain further what amounts of basic slag and superphosphate would give the most economic results; and to compare the effect of barnyard manure with that of artificial manures. Tabulated data give the results of these experiments. Twelve tons of dry sheep's manure produced the largest net profit, followed closely by a 400 lb. application of superphosphate. The total yields of hay per acre ranged from 5,724 to 10,892 lbs.

Broom corn culture, A. G. MCCALL (*New York and London*, 1912, pp. 60, figs. 24).—This book describes the broom corn plant and discusses the soil and climatic conditions, the enemies of broom corn, the harvesting of the crop, by-products, and the manufacture of brooms.

Methods of corn breeding, H. K. HAYES (*Amer. Breeders Mag.*, 3 (1912), No. 2, pp. 99-108, figs. 4).—This paper, continuing previous work (E. S. R., 25, p. 737), presents some evidence to show that practical corn breeding does not at present take advantage of its full possibilities. Five inbred strains figure chiefly in this work. After 5 or 6 years of inbreeding their yields ranged from 2 to 41.3 bu. per acre. The author states that inbreeding does not run out a race but isolates biotypes, that some biotypes can scarcely live unless in a state of hybridity, and that the type after being isolated will not be further affected by constant inbreeding.

The study in reciprocal crosses of biotypes seemed to confirm the following conclusions: (1) Reciprocal crosses are equal within the limits of fluctuating variability, which shows that very nearly pure biotypes were used; (2) all crosses between pure biotypes did not seem to be beneficial; (3) crosses from nearly related types showed little benefit from crossing; (4) some crosses were much more vigorous than others. Reciprocal crosses of these inbred types showed yields ranging from 3.6 to 75.6 bu. per acre. In comparing the F and F₂ generations it was found that there was always a falling off in yield in the F₂ generation, which points to the necessity of making crosses of 2 distinct types each year for maximum yields.

Relative values of crosses between pure biotypes and between highly selected varieties are discussed.

In conclusion it is noted that "the utilization of F₁ hybrids in corn breeding will materially increase the corn yield. Selection is of importance in isolating the better types and ridding the variety of the poorer types. The highest yields of corn will be received from carefully bred selections which when crossed prove the most vigorous combinations by actual test."

Maize experiments at the experimental farm, Potchefstroom, T. O. BELL (*Agr. Jour. Union So. Africa*, 4 (1912), No. 4, pp. 535-538).—This paper reports the results of variety tests of corn, in which the yields of shelled corn ranged from 340 to 520 lbs. per acre. In an experiment as to the proper distance in planting, better results were obtained when the rows were planted 2 ft. apart, than when 2 ft. 6 in., 3 ft. 6 in., or 4 ft.

Manurial experiments on maize, 1911-12, H. J. VIPOND (*Agr. Jour. Union So. Africa*, 4 (1912), No. 4, pp. 529-534).—This paper reports in tabulated form the results of fertilizer trials with corn during the years 1910-1912. The yields ranged from 484 to 2,220 lbs. per acre.

Distance for planting maize, J. BURTT-DAVY (*Agr. Jour. Union So. Africa*, 4 (1912), No. 5, pp. 723-729, figs. 3).—In an experiment to determine the proper distance for planting corn the author reports that the best yield, 2,846 lbs. per acre, was obtained from a distance of 3 ft. 6 in. by 1 ft. 6 in. In a study of the size and shape of the grains of Reid Yellow Dent it was found that the length of grain ranged from 8/16 to 10/16 in., and the width from 5/16 to 6/16 in.

Experiments in corn cultivation, H. DAMMANN (*Rev. Inst. Agron. Montevideo*, 1910, No. 7, pp. 167-172).—Single plants in checks of 40 cm. gave better results than those placed 30, 50, 60 or 70 cm. apart, yielding 4,550 kg. of grain, 940 kg. of cobs, and 5,080 kg. of stover per hectare. In an experiment to determine the value of cultivating corn an increase of 300 kg. of grain per hectare was harvested when the crop was cultivated with a cultivator over when the weeds were simply removed with a hoe without disturbing the soil.

A method of improving the quality of cotton seed, G. D. MEHTA and V. G. GOKHALE (*Dept. Agr. Bombay Bul.* 53, 1912, pp. 12, pls. 3).—This bulletin gives the results with various methods used for the separation of cotton seed, the most successful of which seemed to be that of pasting down the fuzz with flour paste and separating the heavy seeds by means of a blower. It is noted that the germination percentage was increased from 8 to 35 per cent in various cases, according to the quality of the original sample of seed, by passing it through this separator.

Cotton experiments in the Cape Province, A. VAN RYNEVELD (*Agr. Jour. Union So. Africa*, 4 (1912), No. 6, pp. 830-842, figs. 12).—This paper reports a variety test of cotton in which the yields ranged from 810 to 2,067 lbs. per acre. Methods of planting, harvesting, and ratooning, and the estimated cost per acre are reported.

The story of cotton, E. C. BROOKS (*Chicago, New York, and London*, 1911, pp. 370, pls. 2, figs. 92).—The author has divided this book into 17 chapters, which cover the origin and history of the development of cotton, and its culture, manufacture, and use up to the present day in all parts of the world.

On the inheritance of morphological characters of *Hordeum distichum nutans*, C. FRUWIRTH (*Verhandl. Naturf. Ver. Brunn*, 49 (1910), pp. 122-129, pls. 2).—In this paper are reported observations on the hairy condition of the rachilla for 4 generations. Short hair, naked, elongated, or other abnormal forms of the rachilla were not transmitted. The author therefore considers these abnormalities as bud variations and suggests that the hairy condition of the rachilla is a good indication of pure lines in breeding.

Kafir as a grain crop, C. R. BALL and B. E. ROTHGEB (*U. S. Dept. Agr., Farmers' Bul.* 552, pp. 19, figs. 8).—This gives descriptions of varieties, including White Kafir, Blackhull Kafir, Dwarf Blackhull Kafir, Pink Kafir, and Red Kafir corn, and data as to methods of culture of the crop, including harvesting, curing, thrashing, and storing, the yield, and the uses of the crop.

Yields of various varieties at the Cereal Field Station, Amarillo, Tex., from 1908 to 1912 ranged from 3 bu. to 42.6 bu. per acre. "The use of dwarf and early varieties, such as the Dwarf Blackhull, will permit much better yields in dry seasons than can be obtained from varieties of standard height. The dwarf plant actually uses less water in growth. Earliness enables it to mature before a drought occurs. Combined dwarfness and earliness lower the water requirements and so permit the plant to continue growth, even in spite of drought, because the dwarf plant does not use water as fast."

Report on oat experiments (Edinb. and East of Scot. Col. Agr. Rpt. 29, 1913, pp. 21).—This reports and discusses the results and comparisons of yields from 26 varieties of oats obtained at 52 centers in the years 1909-1912. Tabu-

lated yields of grain and straw and the weight per bushel of the grain are included. The yields reached as high as 90 bu. per acre, weighing 42 lbs. per bushel.

Spontaneous omission of the color factor in oats, H. NILSSON-EHLE (*Verhandl. Naturf. Ver. Brünn*, 49 (1910), pp. 139-156, figs. 4).—This paper consists of discussions of the origin of individuals with varying white or gray colored glumes in black varieties, as previously noted (E. S. R., 25, p. 333).

Place-effect influence on seed potatoes, W. STUART (*Vermont Sta. Bul.* 172, pp. 199-216).—Seed tubers from England, Scotland, and Maryland were planted in Vermont in the 6 seasons from 1905 to 1910 inclusive, and the yields compared in charts and tables.

The author concludes "that northern-grown seed is superior to that grown in the south. The effect of one year's removal of the potato from northern influence is generally noticeable, and after this period the decline in yield is quite rapid. After a 6 years' removal from southern influence the southern seed almost, if not quite, equalled that from the north when tested under similar environment; and, except in northern latitudes and under favorable growing conditions, an occasional, if not a frequent, change of seed is desirable."

Cultural experiments with dried sugar beet seed in Hungary, B. JANCsó (*Osterr. Ungar. Ztschr. Zuckerindus. u. Landw.*, 41 (1912), No. 5, pp. 691-697).—This paper reports the results of trials with 2 varieties of beets sown in 30 different localities. One-half of the seeds planted were previously dried at 45° C., until the original 14 to 15 per cent of water was reduced to 6 and 8 per cent.

The germination of the seeds was improved by drying. From 100 balls of one variety, not dried, 83 germinated, and after drying, 87 germinated. Of the other variety 91 germinated before drying and 96 after. The results in the field were contradictory and varied greatly.

Annual report of the bureau of sugar experiment stations, H. T. EASTERBY (*Ann. Rpt. Bur. Sugar Expt. Stas.* [Queensland], 1912, pp. 27).—This report gives the results of acclimatization trials of varieties of cane from Queensland, Barbados, and Mauritius, and the results of variety tests.

The sugar industry of Natal, E. R. SAWER (In *Cedara Memoirs on South African Agriculture. Pietermaritzburg: Govt.*, 1912, vol. 3, pp. 1-142, pls. 8).—This report includes the history of the industry, a discussion of its present status, the results of experiments, and both physical and chemical analyses of soils.

In an experiment to determine the best distance of planting cane the highest yields from 4 crops were obtained by continuous planting in the row with a spacing of 6 ft. between the rows. Tabulated results of variety tests with a description of seedling varieties are given. In manurial experiments it was found that on the whole the crops were better off without nitrogenous manures. The data showed uniformly that manuring without phosphates is of no practical value, and that superphosphate seemed to be the best form of phosphatic manure. The best yield was secured by a combination of potash with superphosphate. In general, it is stated that potash and lime had a satisfactory influence on the composition of the juice. Methods of harvesting and ratooning and for the manufacture of sugar are given in detail.

Notes on the germination of tobacco seed, T. H. GOODSPEED (*Univ. Cal. Pubs. Bot.*, 5 (1913), No. 5, pp. 199-222).—This paper gives the results of germination tests of over 20,000 seeds produced from single plants of 10 species and varieties of *Nicotiana* and from single plants representing the original hybrid seed and the F₁ and F₂ generations in the case of 2 hybrids made between 2 *N. tabacum* varieties.

It is noted that the action of 80 per cent sulphuric acid upon the seed for lengths of time not over 10 to 12 minutes increased markedly the total amount of germination and in certain cases increased the rapidity of germination. The action of concentrated sulphuric acid (sp. gr. 1.84) for periods of time as short as 1 minute killed the seed used. A markedly injurious effect of prolonged washing with running water after sulphuric acid treatment was noted.

"Results at present at hand seem to leave no doubt that in the case of *N. acuminata* varieties at least the action of sulphuric acid is not restricted to weakening the hard outer coverings of the seeds, . . . but that its action is further strikingly effective in increasing the rate of growth during at least the first 3 months of the plant's life."

Six, 7, and 8-year-old tobacco seed was found to give a relatively high percentage of total germination in most cases. Rapidity of germination in general was found to be independent of the age of the seed and to be characteristic of the seed of certain species or varieties throughout and not characteristic of others. A certain period of "after ripening" seemed to be essential for average germination percentages as shown in the case of 1912 *N. acuminata* varieties. Seed taken from dehiscing capsules on the plants in the field gave very low percentages of germination in the case of *N. acuminata* varieties alone. F₁ hybrid seed 3 years old gave higher percentages of germination than the seed of the parents of the corresponding cross and of the same age.

Biological point of view in the examination of seeds, E. SCHAFFNIT (*Jour. Landw.*, 61 (1913), No. 1, pp. 57-71).—In this paper the author discusses the germinative ability and vegetative force of seeds, and points out the value of using determinations of the latter in placing values on seeds since it bears a more direct relation to field results. It is shown that when the germinative ability was about 90 per cent for cereal seeds the vegetative force was only about 70 per cent. Results of artificial unfavorable vegetative conditions, such as extremes in temperature, too severe treatment with copper sulphate and formalin solutions, old seed, seed infected with *Fusarium*, and unfavorable soil conditions, as heavy clay, compared favorably with field conditions and served as a means of determining the percentage of seeds that would not produce mature plants. It is suggested that some means be employed in the grading and cleaning of seeds to discard these weak germs, which on the average equal about one-fifth of the cereal seeds that are sown.

Tables give tests of the germinative ability and vegetative force of numerous samples of rye, wheat, barley, and oats.

Determination of the germinative energy of seeds based on the mean time of germination, G. D'IPPOLITO (*Staz. Sper. Agr. Ital.*, 45 (1912), No. 4, pp. 302-320).—The author considers that the mean time of germination is the proper basis for the comparison of germination tests. Tabulated results of germination tests of several samples of seeds, including clovers, lupines, broom plant, grasses, vetch, maize, beets, wheat, oats, rice, and hemp are given.

The effect of hot water and mechanical treatment on seeds during germination, H. A. DODGE (*Vermont Sta. Bul.*, 170, pp. 134, 135).—To hasten the germination of some seeds that required special treatment, they were subjected to a mechanical treatment by filing, and to a hot water treatment with temperatures ranging from 80 to 212° F., for periods of from 10 minutes to 48 hours.

"The results attained seem to indicate that ninebark and honeysuckle seed should be treated with hot water; that the germination of others may be thus hastened, barberry and dogwood being soaked for an hour and Virginia creeper and roses and Boston ivy for a less time; and that hot water treatment may be considered to be superior to stratification."

Seeds which were mechanically treated usually germinated first, but the total germination was less than with other treatments.

Seed analyses, J. P. HELYAR (*Vermont Sta. Bul. 170, pp. 135, 136*).—This comprises notes on purity and germination tests of 45 samples of alfalfa, alsike clover, red clover, redtop, and timothy seeds.

Result of seed tests for 1912, F. W. TAYLOR (*New Hampshire Sta. Bul. 164, pp. 15*).—This bulletin gives the results of seed tests made from July 1, 1911, to December 1, 1912. It is noted that there has been a steady decrease in the number of samples sent in for testing during the past 2 years, but that the purity and vitality of the samples show improvement. The text of the New Hampshire seed law and advice to senders of samples are appended.

Suggestions for the identification of the "seeds" of quack grass (*Agropyron repens*), western wheat grass (*A. smithii*), and slender wheat grass (*A. tenerum*), J. T. SARVIS (*Brookings, S. Dak., 1913, pp. 6, figs. 3*).—This paper suggests the identification of these grasses as follows: For *Agropyron repens*, the rachilla puberulent, each hair usually conspicuously glandular at its base, the palea glabrous except at the tip, but glandular, and hairs pronounced at the tip of the palea and inside the tip of the lemma; for *A. smithii*, the rachilla puberulent but not so glandular as in *A. repens*, the palea hispid all over its front and not so conspicuously glandular as in *A. repens*; and for *A. tenerum*, the rachilla villous, and the tip of palea puberulent.

Concerning certain pasture weeds, A. H. GILBERT (*Vermont Sta. Bul. 170, pp. 127-130*).—This article notes the spread of the shrubby cinquefoil (*Potentilla fruticosa*) in Vermont (E. S. R., 15, p. 1085) and that the weed was found to be killed when its roots come in contact with the roots of butternut trees. The tree roots seemed to be attracted by the weed and grew in the direction of weed clusters. No explanation of these results is offered.

Moss as a pasture weed, J. J. TRACY (*Vermont Sta. Bul. 170, pp. 130, 131*).—This article gives the results of the use of lime, wood ashes, and nitrate of soda in eradicating a group of mosses known as "hair caps," especially *Polytrichum commune*. Nitrate of soda proved the most successful in killing out the weed and restoring grass to the pasture land.

The ensiling of weeds, R. M. WASHBURN (*Vermont Sta. Bul. 170, pp. 131-133*).—In an attempt to discover the effect on germination of ensiling seeds, samples of a large number of seeds of grain, grasses, legumes, weeds, etc., were placed in sacks distributed in a silo as it was being filled. A maximum thermometer was placed with each stack and the seeds remained in the silo for periods ranging from 2 to 22 months.

Germination tests, made upon removing the seeds from the silo as the silage was fed out, showed the seeds to be dead in nearly every case. In one instance alsike and white clover showed a 5 per cent germination, and in a few cases alsike clover, crab grass, sorghum, red clover, alfalfa, wormseed mustard, and *Amaranthus* sp. showed a 1 per cent germination. The registered temperature ranged from 24 to 45.5° C.

The author concludes that the ensiling process, even under conditions when temperatures do not rise to a high point, serve to destroy the viability of the seeds of the more common weeds of this section.

HORTICULTURE.

The relation of light to greenhouse culture, G. E. STONE (*Massachusetts Sta. Bul. 144, pp. 3-40, figs. 9*).—This bulletin reports investigations of various factors which influence the amount and intensity of light in greenhouses. The experimental work is introduced by a brief discussion of the physiological

effect of light, and of the relation of light to greenhouse culture, pathological conditions, and greenhouse construction and management.

All light records in these experiments were obtained by exposing tubes of a uniform size and quality of glass filled with certain chemical solutions sensitive to light. Tests were made of morning light *v.* afternoon light, different qualities and kinds of glass, new *v.* old glass, the effects of different angles of glass on the light in greenhouses, reflection of light from different surfaces, loss of light from lapped glass and shadows, intensity of light at different distances from the glass, loss of light from glass as compared with outdoor light, and the relative value of different types of houses from the point of view of light.

In these experiments morning light was on an average 10 per cent more intense than afternoon light. This difference varies throughout the year and from year to year. In some months it is as high as 30 per cent. In order to take advantage of the more intense morning light, it is suggested that houses which are usually placed east and west should be given a direction of from 15 to 30° north of east. The additional light thus given the plants will lessen the danger of infection from fungus diseases when it becomes necessary to syringe the plants. Other influences being equal, a crop will show a greater development on an east than on a west exposure.

Considerable difference was found in the light-transmitting properties of glass. Second quality, double thick, greenhouse glass transmits 18 per cent less than No. 1, double thick, and the third quality, double thick transmits 33 per cent less than No. 1, double thick. An irregular surface and defects, such as bubbles, etc., in glass act as lenses and affect the even diffusion of light. New glass proved to be slightly superior to used glass but the deterioration from dirt and other factors is much less than 1 per cent per annum. In these tests the practice of lapping glass caused an average loss of light of about 11 per cent. The loss of light from glass as compared with outdoor light may vary from 13 to 36 per cent or more, depending on the quality and condition of the glass and many other factors.

It was found that transmission of light increases as the angle of the roof more nearly coincides with the right angle of the sun's rays. The reflection of light from surfaces varied greatly. In these experiments aluminum bronze color constituted the best reflector of light. There appear to be no important differences in the light in a greenhouse at different distances from the glass, except immediately under the glass where the light varies in intensity owing to the irregularity of the surface. Practically the same light is obtained at 5 ft. as at 30 ft. from the glass. Double glazed houses are much inferior as to light transmission to single glazed houses.

[Horticultural investigations in Alaska], C. C. GEORGESON ET AL. (*Alaska Stas. Rpt. 1912, pp. 10-13, 16-27, 55, 56, 66, 67, pls. 4*).—As a result of the crosses between cultivated strawberries and the native berries of the coast region (E. S. R., 28, p. 435), 334 out of more than 2,600 hybrid seedlings have produced large to very large berries, and many others have yielded medium-size berries equal to the average cultivated berry. The work of selection among the best varieties will be continued. Crosses have also been made between cultivated varieties and the species of interior Alaska with a view of securing improved varieties which will prove to be hardier than the cultivated coast-region hybrids. It is not expected that any of these strawberries will do well south of latitude 49°.

The following varieties of apples in the test orchard at Sitka set fruit in 1912: Tetofsky, Raspberry, Patten Greening, Oldenburg, Whitney, Hyslop, *Pyrus baccata*, and the native crab. Of these, fruit matured only on the last 4 named.

As a whole the climate and soil are so unpropitious that the outlook for apple growing in Alaska is not bright. Sour cherries continue to thrive and bear indifferently. Sweet cherries have proved to be a failure and so far not a variety of plum gives promise of being a success.

The notes on various small fruits are quite similar to those for previous years (E. S. R., 28, p. 436). They indicate in general that small fruits and berries succeed well in Alaska.

The vegetable trials were continued with much success at the Sitka Station and also at some of the branch stations. Of the ornamentals tested, *Rosa rugosa* is deemed the best shrub, although the Tartarian honeysuckle in all varieties and the Siberian pea tree do well. Of the perennial herbaceous plants, the columbine blooms profusely in the coast region. Other varieties doing well are the phlox, forget-me-not, spirea, iris, primula, and the herbaceous peony.

Report on vegetable and flower gardens in southeastern Alaska, J. E. W. TRACY (*Alaska Stas. Rpt. 1912, pp. 77-82, pls. 6*).—This comprises observations on the character of fruit and vegetable gardens in various parts of southeastern Alaska.

The author concludes in general that the flowers do splendidly, producing fully as large and as bright colored blooms as those in the States, while vegetables are of excellent quality, being unusually tender and of mild, delicate flavor. Wherever satisfactory results are not secured the cause appears to be due to the shiftlessness and general indifference relative to gardening rather than to cultural difficulties.

Pop corn for the market, C. P. HARTLEY and J. G. WILLIER (*U. S. Dept. Agr., Farmers' Bul. 554, pp. 16, figs. 12*).—A practical treatise on the culture of pop corn for the market. The subject matter is discussed under the general headings of varieties of pop corn, extent of production, popping quality, culture of pop corn, market supply, and does it pay to grow pop corn.

The authors conclude in general that if the good years are averaged up with the poor ones this crop will be found to pay about as well as field corn. On the other hand it would not be advisable to carry on its culture on a large scale owing to the limited market for this crop.

Pop corn for the home, C. P. HARTLEY and J. G. WILLIER (*U. S. Dept. Agr., Farmers' Bul. 553, pp. 13, figs. 9*).—A popular treatise on pop corn culture, including also instructions for popping corn and various methods of utilizing pop corn in the home.

Cultural studies on the Montreal market muskmelon, W. STUART (*Vermont Sta. Bul. 169, pp. 103-116, pls. 4*).—In continuation of previous observations (E. S. R., 20, p. 335) this bulletin reports studies relative to the adaptability of the Montreal muskmelon for culture in Vermont. The studies, which were continued through the period 1908 to 1911, inclusive, comprised especially observations on the behavior of a number of different strains, both at the station and also on private grounds at Chazy, N. Y., and at Montreal, Canada. Notes and data are given on the behavior of the melons on the 3 testing grounds, including descriptive notes and data reported by Straughn and Church, of the Bureau of Chemistry of the U. S. Department of Agriculture, on samples submitted to them for analysis.

The following general conclusions are drawn from the studies thus far made: The Montreal market muskmelon may be successfully grown in the Northeastern States, provided the crop is handled as skillfully and intelligently as it is by the Montreal grower. There appear to be at least 2 distinct types and possibly a number of distinct strains. Chemical analysis of the melons affords some guide to the selection of high quality strains. The crop is a costly one to grow, but the demand exceeds the supply and the sales prices are so high that the en-

reprise when successful is a highly remunerative one. The development of a uniformly high quality strain is believed to be well worth the attention of the plant breeder.

Potato culture in West Virginia, A. L. DACY (*West Virginia Sta. Bul. 140, pp. 3-34, figs. 16*).—In the first part of this bulletin the author presents data to show the possibilities of growing the potato in West Virginia, both as a truck crop and for seed purposes. The succeeding part briefly outlines the most essential practices in the culture of the potato as a truck crop.

In order to test the value of West Virginia seed stock as compared with northern-grown seed the station, working in cooperation with the Bureau of Plant Industry of the U. S. Department of Agriculture, arranged for the culture of sample plats of both West Virginia and northern-grown seed near Norfolk, Va., both on a private plantation and at the Virginia Truck Experiment Station. As indicated by the results of the past season's test, here tabulated, West Virginia seed compares very favorably with the northern-grown seed for use in the coastal region of Virginia.

Tomatoes for the canning factory, C. A. McCUE and W. C. PELTON (*Delaware Sta. Bul. 101, pp. 2-86, figs. 4*).—This bulletin comprises a detailed survey of the tomato industry in Delaware, including cultural recommendations based on the experience of growers throughout the State and on that secured from the station's investigations. A descriptive list of varieties that have been grown by the station during the past 4 years is also included.

Summarizing the results relative to soil conditions the authors find that a sandy loam, plentifully supplied with humus and underlain with a well-drained clay subsoil, is ideal for the production of tomatoes for canning purposes, but the tomato plant is dependent more upon food supply and moisture in the soil than on certain proportions of sand and clay. The plants require a large quantity of readily available plant food early in the season, and a soil condition that will keep the plants well supplied with moisture, especially during the latter part of the season.

Crimson clover seeded at the last cultivation of tomatoes and turned under before the clover is in blossom furnishes a good green manure crop for tomatoes, but the soil should be well compacted and there should be sufficient moisture present to rot the clover quickly. Stable manure is most economically applied to the land on some other crop. The tomato uses little phosphoric acid and a relatively large amount of potash. The authors recommend a fertilizer containing from 3 to 5 per cent of quickly available nitrogen, 5 to 7 per cent phosphoric acid, and 8 to 10 per cent potash, to be used at the rate of from 400 to 800 lbs. per acre. A number of rotations wherein tomatoes may be used in connection with corn, wheat, and other crops are suggested.

The experience in Delaware indicates that it will pay the grower to save his seed from selected plants. Special attention is called to the results secured by Wellington (E. S. R., 27, p. 239), who found increased yields from first generation crosses of selected parents. The authors point out that since the cross will not come true in the second generation, a large number of crosses may be made in one year for stock seed and this seed used as long as it retains good germinating properties.

The average cost of producing and marketing an acre of tomatoes in Delaware is reported as \$38.61. The average yield per acre of all varieties grown at the station was 15 tons in 1909, 9.1 tons in 1910, 8.4 tons in 1911, and 15.7 tons in 1912. On the basis of cannery prices it is concluded that a crop can not be called a profitable one unless 7 tons per acre are produced and that the tenant farmer must produce a 10-ton crop.

Stone, Paragon, Matchless, Red Rock, Success, and Delaware Beauty are the most popular varieties for canning in Delaware. As a result of other variety tests the Delaware Station recommends Hummer, Great B. B., Greater Baltimore, Matchless, Success, Favorite, Stone, and Brandywine. Where a very early pick is desired Perfection is recommended, and where a late pick is desired Coreless will probably prove to be the best.

Exhibiting fruit and vegetables, R. M. WINSLOW (*Brit. Columbia Dept. Agr. Bul.* 48, 1913, pp. 32).—This constitutes a bulletin of information relative to the exhibition of fruits and vegetables, prepared especially for use at the various fairs in the Province of British Columbia. Instructions are given relative to the preparation of exhibits, use of score cards, and making prize lists, together with rules and regulations relating to fruit and vegetable sections.

[Fruit growing, cold storage, etc.], J. F. MOODY (*Dept. Agr. and Indus. West Aust., 1912, Buls.* 16, pp. 16; 22, pp. 34, figs. 35; 28, pp. 6; 31, pp. 7; 32, pp. 8; 34, pp. 10).—These bulletins present popular discussions of the following subjects: No. 16, Manurial Requirements of Fruit Trees; No. 22, Orchard Irrigation and Drainage; No. 28, Some Principles in Fruit Growing; No. 31, Cold Storage of Fruit, in which the author discusses the advantages to be derived from the cooperative cold storage of fruit, describes three methods of cold storing in use, and gives brief suggestions relative to the requirements of various kinds of fruit in cold storage; No. 32, Commercial Apple Cultivation; and No. 34, The Cultivation of the Orange.

Variety adaptation, W. S. THORNER (*Proc. Oreg. State Hort. Soc.* 27 (1912), pp. 75-92).—A paper with a discussion following, in which the author presents his observations covering several years relative to the adaptation of a large number of commercial varieties of deciduous fruits in different sections of the Pacific Northwest. With these observations as a basis a list is given of apples, pears, cherries, and peaches adapted for the coast region, inland valleys, and inland uplands.

The rejuvenation of old orchards, W. H. ALDERMAN (*West Virginia Sta. Bul.* 141, pp. 37-56, figs. 9).—In this bulletin the author discusses the causes leading to the decadence of orchards, suggests methods for their rejuvenation, and gives a record of 6 orchards in West Virginia which were renovated under the direction of A. L. Dacy. None of these orchards had produced a profitable crop for several years before it was taken hold of by the station. Although some of the weakest of these orchards failed to return a profit on the first year's operations, by the second season a crop was secured in every case that more than paid all expenses.

Commercial fertilizers for strawberries, W. H. CHANDLER (*Missouri Sta. Bul.* 113, pp. 279-305, figs. 5).—This bulletin reports the results of cooperative fertilizer experiments with strawberries made in the vicinity of Sarcoxie, Jasper County, Missouri. It also briefly discusses the nature of the strawberry plant and best methods of care as indicated by the experience of successful growers. Data secured from a number of growers are also given relative to the cost of growing strawberries and profits derived.

The results secured with fertilizers indicate that for that section of Missouri at least no form of nitrogen-bearing or of potassium-bearing fertilizers should be used on a strawberry bed, except on small trial plats. It is recommended that about 250 to 300 lbs. of acid phosphate or probably steamed bone meal be used, preferably 1 year before the crop is harvested, on all but the very richest strawberry soils.

Lime cultivation in the West Indies, F. WATTS ET AL. (*Imp. Dept. Agr. West Indies Pamphlet* 72, 1913, pp. 136, figs. 17).—In this handbook, which supersedes a previous pamphlet of the same series (E. S. R., 20, p. 840), the

available information concerning the lime industry has been brought up to date.

Part 1 discusses the lime, its cultivation, pests, and diseases. Part 2 discusses lime products, the crop, and methods of disposing of it. A list of references to literature on lime cultivation in the West Indies is included.

Cacao: Manuring and shading (*Dept. Agr. Ceylon Bul. 5, 1913, pp. 75-78*).—This bulletin records the yields secured from cacao trees which were given various fertilizer treatments during the period 1906 to 1912. All of the fertilizer plats have shown much increased yields over the unfertilized plats. Considerable variation in yields on the latter plats, however, renders it impossible thus far to place the various fertilizer mixtures in their true position as to value.

The shading experiments with cacao show in general beneficial results from starting the young plants off with a sufficient amount of shade.

The cashew (*Anacardium occidentale*), L. GRANATO (*Bol. Agr. [Sao Paulo], 14. ser., 1913, No. 2, pp. 107-122, figs. 5*).—An account of the cashew with reference to its botany, habitat, climatic and soil requirements, and economic uses, with suggestions relative to its cultural treatment in northern Brazil.

Manurial experiments on coconuts, J. DE VERTEUIL (*Bul. Dept. Agr. Trinidad and Tobago, 11 (1912), No. 71, pp. 179-184*).—Fertilizer experiments conducted on a number of plantations in Trinidad, including the results for the first season, are reported.

The inspection, certification, and transportation of nursery stock in New York State, other States, and Canada, G. G. ATWOOD (*N. Y. Dept. Agr. Bul. 52, 1913, pp. 21*).—This bulletin gives a brief synopsis of the laws and regulations of the United States, the several States, and Canada relative to the inspection, certification, and transportation of nursery stock.

FORESTRY.

Economic botany of Alabama.—I, Geographical report on forests, R. M. HARPER (*Geological Survey Ala. Monograph 8, 1913, pp. 228, pl. 1, figs. 64*).—This is the first of a series of reports on a study of the economic botany of Alabama which is being conducted under the direction of the Geological Survey of that State. It includes descriptions of the natural divisions of the State, and their forests and forest industries, together with quantitative analyses of the forests of each region and statistical data on the forest industries of the State. A bibliography of cited literature is given.

The fifth annual report of forest conditions in Ohio (*Ohio Sta. Bul. 254, pp. 157-210, figs. 21*).—This comprises a brief introductory report of the work of the department of forestry for the year ended November 15, 1912, by C. E. Thorne (p. 157) and a detailed report by the forester, E. Secrest (pp. 159-201), in which information is given relative to operations at the nurseries and permanent plantations on the station farm, cooperative work with various institutions, lectures on forestry, and assistance rendered to municipal park departments. A number of recommendations are given relative to legislation leading to better forest protection, forest extension, and improved forest taxation.

An article on Forest Parks, by W. J. Green (pp. 202-206), is also included. The laws of Ohio relating to forestry are appended.

1888 to 1913, 25 years of state and private forestry in Prussia, SEMPER (*Ztschr. Forst u. Jagdw., 45 (1913), Nos. 6, pp. 341-369; 7, pp. 430-446*).—A general statistical review of state and private forest operations in Prussia during the past 25 years.

A review of the net revenues from the Saxony state forests for the year 1911, VOGEL (*Tharand. Forstl. Jahrb., 64 (1913), No. 3, pp. 198-212*).—This

comprises a statistical review for the year 1911 relative to the yield in lumber and minor forest products, receipts, expenditures, and net returns from the state forests in the various districts of Saxony.

Methods of identification of Philippine woods, E. E. SCHNEIDER (*Philippine Craftsman*, 1 (1912), No. 6, pp. 466-486, figs. 36).—In this paper the author discusses the various elements to be observed in the study of wood sections for the purpose of identification. Descriptions with several photographic illustrations are then given of a large number of Philippine woods with reference to their structure as seen in cross sections.

The trees of Great Britain and Ireland, H. J. ELWES and A. HENRY (*Edinburgh*, 1913, vol. 7, pp. VIII+1653-1933, pls. 42, figs. 2; *Index*, pp. XXIV+1935-2022).—This is the seventh and last 2-part volume, together with a separate index, of an extensive treatise on the trees which are native or cultivated in Great Britain and Ireland (E. S. R., 28, p. 145).

In part 1 the varieties and species of *Tilia*, *Trachycarpus*, *Acanthopanax*, *Acacia*, *Laurelia*, *Ilex*, *Buxus*, *Cratægus*, *Salix*, *Populus*, *Ulmus*, and *Koelreuteria* are considered relative to their botany, distribution, and cultivation, as well as the history and economic value of the more important forms. In many instances specimen trees growing in Great Britain are described.

Part 2 consists of illustrations and botanical drawings of the trees discussed in part 1.

In connection with the index a list is given of errata and addenda for the entire work.

Yield investigations in oak high forests, WIMMENAUER (*Allg. Forst u. Jagd Ztg.*, 89 (1913), Aug. pp. 261-267).—In the author's earlier investigations of oak high forests on the Rhine (E. S. R., 13, p. 753) volume and financial yield and increment were considered in connection with crowded stands in which only the suppressed trees were taken out. For several years observations have been made on experimental areas on which the forests have been converted to the open-stand system. As a result of these studies yield tables for oak high forests of various qualities grown under the open-stand system are here presented, together with a yield table for beech underwood based on a study of some 30 experimental areas.

Investigations on the value of accretion of pine and spruce, SCHWAPPACH (*Ztschr. Forst u. Jagdw.*, 45 (1913), No. 8, pp. 496-502).—This comprises a statistical study of the relation between volume and value accretion in increasing aged pine and spruce stands.

Plantation rubber in Hawaii, W. A. ANDERSON (*Hawaii Sta. Press Bul.* 44, pp. 12).—In continuation of previous bulletins (E. S. R., 17, p. 566; 22, p. 645) this summarizes recent observations and experiments dealing with the rubber industry in Hawaii.

Among the results in starting plantations it has been found that cuttings of rubber plants have grown and yielded as well as seedlings under the same conditions; hence it is concluded that propagation by selected cuttings from the best yielding trees is the best means of extending the plantations, since it is possible that the well-known variation in yielding capacity of different trees may be largely eliminated thereby. When the plantation is started with seedlings, close planting followed by selective thinnings with a final spacing of about 20 by 20 ft. appears to be more advantageous than initial plantings of 20 by 20 ft. It is believed that a proper adjustment of the tapping system will tend to reduce the necessary additional cost of tapping per acre caused by irregular spacing to a negligible point as compared with the advantages of close planting. In addition to the possibility of culling out low-yielding trees, close planting covers the ground quickly with foliage, thereby reducing weeding expense and

erosion. The trees protect each other against wind damage and tapping returns for the first few years are greater.

The cheapest effective method of weed eradication is by means of arsenite of soda, but this substance should not be allowed to touch the foliage of any trees, or the stems of Ceara trees under 2 years of age or older trees where the outer bark has been recently removed. Arsenite of soda should never touch Hevea trees. Indications are that soil aeration in the Nahiku rubber district can be obtained without excessive erosion by using dynamite. The results from the fertilizer tests thus far made seem to indicate that the additional cost of the fertilizers does not warrant their use.

The best method of tapping so far discovered is by removing the outer bark in narrow vertical strips and tapping these strips by incision, allowing the latex to coagulate on the ground. The method of tapping is described in detail. Relative to the proper season for tapping, it is concluded that good yields can be obtained from September to April in ordinary seasons.

Although a large amount of dirt is collected with the rubber allowed to flow on the ground, this is removed by washing with corrugated rollers which leave it in the form of coarse crepe. A uniform product of high quality is obtained by drying for 2 weeks or more in the air at ordinary temperature and finishing in a vacuum dryer at a temperature not greater than 120° F.

The product of the Hawaiian plantations can be depended upon to bring a price within from 5 to 10 per cent of that of Ceylon plantation rubber.

The effect of nitrate of soda and saltpeter on the flow of Ceara latex, R. D. ANSTEAD (*Planters' Chron.*, 8 (1913), No. 32, pp. 384-387).—In continuation of the previous preliminary experiment (*E. S. R.*, 25, p. 240) trials were made during 1912 with both nitrate of soda and nitrate of potash on plats of 50 trees each.

The results of the tapping experiments as here tabulated and discussed again show that nitrate of soda does stimulate the flow of latex on areas which have not normally yielded well. On other areas it apparently does not improve the condition. Nitrate of potash appears to give a still greater latex yield than nitrate of soda on areas which do not normally yield well. The experiment is to be continued.

Castilla rubber in Dominica, J. JONES and G. A. JONES (*West Indian Bul.*, 13 (1913), No. 3, pp. 253-258).—A review of various tapping experiments that have been made with Castilla rubber trees leads the authors to conclude that as far as conditions in Dominica are concerned the yields do not warrant the cultivation of *Castilla elastica*.

DISEASES OF PLANTS.

Report of the department of botany, O. BUTLER (*New Hampshire Sta. Bul.* 163, pp. 16, 17).—A brief account is given of the botanical work in progress at the station, two of the investigations having been reported upon elsewhere (*E. S. R.*, 27, p. 849; 28, p. 348). Notes are also given on the leaf spot of the apple due to *Sphærospis malorum*.

Work connected with insect and fungus pests and their control, F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Bot. Sta. Montserrat, 1911-12* pp. 16, 17).—Experiments with 5 varieties of peanuts were carried out in 1911 in which applications of Bordeaux mixture were made 77 and 102 days after planting. It is admitted that as the results are inconsistent it has not been demonstrated that the fungus was in the past years responsible for a shortened crop or that it affected the quality of the nuts in any way.

The cause of cotton boll soft rot, it is stated, has not been determined, but it is suggested that the probable cause is a species of *Pythium* or *Phytophthora*. The loss due to this fungus is considerable and is found to be greater when the growth of the plant is crowded.

[Plant diseases in Jamaica, 1913], R. S. MARTINEZ (*Ann. Rpt. Dept. Agr. [Jamaica], 1913, p. 16*).—The study of banana diseases results in the statement that rotation of crops appears to be imperative in all serious cases, replanting with bananas on infected land being out of the question in the case of Panama disease and the application of Bordeaux mixture being impracticable to the majority of owners in case of black spot disease. Careful selection of suckers for planting is emphasized. The application of lime to some soils deficient therein has been shown to increase considerably the resistance of banana plants to parasitic diseases.

Coconuts have suffered a good deal from leaf disease in some localities. Pestalozzie has proved a serious pest, requiring strong measures. Removal and burning of diseased foliage, followed by thorough spraying with Bordeaux mixture, is recommended, with special attention looking to vigorous growth. Further efforts are to be made to secure a systematic survey looking to the eradication of bud rot, the most dreaded disease of coconuts in this region.

Mycological work in Southern Nigeria, C. O. FARQUHARSON (*Ann. Rpt. Agr. Dept. South. Nigeria, 1912, pp. 6-9; abs. in Agr. News [Barbados], 12 (1913), No. 296, p. 286*).—Brief accounts are given of a number of diseases observed on rubber, cacao, and cotton.

The most important diseases of rubber trees are said to be those caused by *Pomes scitostus* and *Hymenochaete noxia*. A stem disease of Para rubber known as the pink disease, caused by *Corticium salmonicolor*, is also reported upon.

The principal diseases of cacao are those caused by the 2 species first mentioned as attacking rubber trees, and also pod diseases due to *Thyridaria tarda* and *Nectria bainii*.

The report on the diseases of cotton is divided into the diseases of American and native cottons. The diseases of American cottons that are most troublesome are those due to physiological disturbances, but other diseases, such as mildew and anthracnose, are also present. The chief disease on the native cotton is termed leaf curl. This seems to be an abnormality reducing the size of the leaves and often restricting flowering, for which no cause has been determined. Another disease of native cotton is characterized by the blackening of the midrib and main veins of the leaves. Bacteria and a species of *Fusarium* have been found in connection with this disease, but the experiments have not yet shown whether or not they are the primary cause of the trouble.

The unattached aecial forms of plant rusts in North America, A. G. JOHNSON (*Proc. Ind. Acad. Sci., 1911, pp. 375-413*).—"It has been the purpose of this study to make such separation farther than it had already been made, and to determine as far as possible the number of forms still unattached and to work out clues for probable connection wherever possible. The forms of aecia whose telial connections still remain unknown are arranged and follow in the form of an annotated list preceded by a provisional key. . . . Under each species are given as far as possible the citation of the original description and date of publication, the hosts inhabited, the States and provinces in which the species has been found on each host, the type locality, type host, general distribution, and reference by number of specimens published in sets of exsiccati. Notes follow in most cases."

An index of species of *Aecidium* is given, also an index of the genera of hosts.

Uredinales on Carex in North America, J. C. ARTHUR (*Mycologia*, 5 (1913), No. 4, pp. 240-244).—Continuing a previous communication (E. S. R., 26, p. 645), the author states that "the purpose of this article is especially to call attention to the material being used for study." Also it is intended to "illustrate some features of the method employed in preparing the manuscript for the rust part of the North American Flora. . . . It may also indicate to collectors the desirability of including in rust collections such parts of the hosts as best serve to permit of their independent verification or determination."

It is stated that all *Carex* rusts belong to either the genus *Nigredo* or *Dicæoma*. The material for the species under *Nigredo* was published about a year ago. The *Carex* material for the genus *Dicæoma* is now being studied.

Prevalence and prevention of stinking smut in Indiana, C. R. ORTON (*Proc. Ind. Acad. Sci.*, 1911, pp. 343-346).—The author states, as the result of extensive inquiry, that this fungus, *Tilletia foetens*, may be completely controlled at a cost of about 0.5 ct. per bushel by careful application of the formaldehyde treatment. The solution employed should be of 0.1 per cent strength and the grain, after being thoroughly mixed therein, should be well dried by spreading and stirring.

Late blight of barley, A. L. BAKKE (*Proc. Iowa Acad. Sci.*, 19 (1912), pp. 93-102, pls. 3).—The author summarizes the results of a study of late blight of barley substantially as follows:

Helminthosporium teres, known in Europe since 1881, was first discovered in the United States in 1907 at Ames, Iowa, but was not destructive enough to cause appreciable loss until the season of 1909. This fungus occurs upon barley alone and can not grow on any other host. It causes the greatest destruction through the formation of its conidia. Further than this, pycnidiospores and sclerotia have been developed culturally, and in all probability perithecia, with asci and ascospores develop from the sclerotia. Inoculation experiments verify the view that the disease is transmitted largely by the seed, and that temperature and moisture play an important part in its development. Seed should be sown when the temperature is sufficient to insure germination but low enough to retard the growth of the fungus. The disease can be best checked by treating the seed with formaldehyde. Soil sanitation methods are important factors in following out remedial measures.

A bibliography is added.

Prevention of bunt in wheat.—Experiments with fungicides at Cowra Experiment Farm, 1911-12, M. H. REYNOLDS (*Agr. Gaz. N. S. Wales*, 24 (1913), No. 6, pp. 461-476).—The results of these experiments may be summarized as follows:

The wheat tested in 1912 appeared less liable to bunt than that used in 1911. Treatment with a 2 per cent solution of copper sulphate without subsequent dipping in limewater or fresh water was very injurious to germination, as was also the case with a solution of copper sulphate and salt and with formalin solution in the proportion commonly used (1:400). The copper sulphate and limewater treatment was found to be comparatively satisfactory in these experiments, but fungusine had the minimum effect on the germination average for the 2 years. Immersing the wheat in water 15 minutes prior to placing it in 0.25 per cent solution of copper sulphate for 10 minutes killed only 9.53 per cent of the seed grain in 1912. The method of immersing the grain in fresh water after treatment with copper sulphate did not prove to be very satisfactory and was found to increase susceptibility to bunt. In 1912 a general reduction in smut attack was noted in treated grain, formalin and scaleicide being the least effective. In the combined treatment with copper sulphate and limewater, delaying the latter for 1 hour after applying the former reduced germination 24

per cent. In the combined treatment of copper sulphate and salt it was found that the fungicide became less effective as the proportion of salt increased. In using fungusine, by far the best results were obtained by keeping the sediment well stirred up. The results to date indicate that immersion in limewater after treatment with copper sulphate is beneficial. As to the combined effects of strength and time of immersion, it was found that reducing the former and increasing the latter gave superior preventive effects, less injury to germination, and a lower degree of reinfection on subsequent exposure.

A new grass parasite, *G. MASSEE* (*Roy. Bot. Gard. Kew, Bul. Misc. Inform.*, 1913, No. 6, pp. 205-207, fig. 1).—The author reports and describes a disease first observed in 1908, when the trouble was checked by removing and burning all diseased patches of grass. In 1913 it reappeared in a number of localities, but so far seems to attack only those grasses which are most prevalent in lawns.

The disease is said to be due to *Cladockytrium graminis* and investigations with grass seed produced from diseased plants showed that the fungus was carried over in the seed. Watering a plat of *Poa annua* with a solution of $\frac{1}{2}$ lb. sulphate of iron to 1 gal. water checked the disease. The parasite is thought to have been introduced from the continent, as it had not been previously reported as indigenous to Great Britain.

Cotton anthracnose and how to control it, W. W. GILBERT (*U. S. Dept. Agr., Farmers' Bul.* 555, pp. 8, figs. 8).—This is a popular description of cotton anthracnose, due to *Glomerella gossypii*, with suggestions for its control. The methods available for the reduction of loss are said to be the selection of seed free from disease, rotation of crops, combined with fall plowing, and the use of varieties least susceptible to the disease.

A typical case of curly leaf of cotton in the greenhouse, R. THIELE (*Ztschr. Pflanzenkrankh.*, 23 (1913), No. 4, pp. 198-201).—A recent study carried out by the author with reference to that of G. Kränzlin (*E. S. R.*, 25, p. 846) on cases observed in German East Africa leads him to the view that lack of proper nourishment and moisture are the primary causes of this trouble, and that as the result of the consequent weakening of the plant, the cicadas are able to inflict the further injury noted. It is suggested that better control of the water and food supply of the plants may prove an effective remedy.

Diseases of ginseng caused by Sclerotinias, G. A. OSNER (*Proc. Ind. Acad. Sci.*, 1911, pp. 355-364, figs. 6).—Of the 6 or 7 highly important diseases of ginseng, the author here discusses 2, giving results of a recent study thereon.

Black rot, now distributed in New York and some other States, is said to be caused by a *Sclerotinia* flourishing best in cold weather; the sclerotia, it is stated, being able also to withstand boiling water for several minutes. It is said to spread from plant to plant through the soil and to be carried on tools and otherwise, and to thrive equally well in alkaline or acid soils. Removal of all suspected roots and disinfection with corrosive sublimate or formalin is recommended, as is also sterilization with steam. The fungus is thought to be able to remain in the soil as a saprophyte for several years.

Crown rot, reported from parts of New York and as far west as Wisconsin, is said to show at least 2 different types, one attacking the upper part of the stem and the other the root near the crown. Its activity seems to be increased by abundant moisture. The disease is attributed to *S. libertiana*. It appears to be disseminated by both mycelium and spores and to be unaffected by changes in acidity or alkalinity of the soils. Spraying with Bordeaux mixture and the removal and destruction of affected plants are recommended.

Sugar cane diseases, J. J. CHAVANNE (*Bol. Min. Agr. [Buenos Aires]*, 14 (1912), No. 8, pp. 738-756, figs. 6).—The author gives the results of some observations and experiments made by himself and others on the several dis-

eases of sugar cane, recommending among various protective measures the selection of sound seed for planting and the development of resistant varieties.

[Lime treatments of soil for *Plasmodiophora brassicæ*], D. A. GILCHRIST (*County Northumb. Ed. Com. Bul. 19, 1913, pp. 86-91*).—The swede crop of 1903 having been practically destroyed on certain plats by finger-and-toe disease, this ground was employed to test the effectiveness of various lime dressings in checking the disease. During the following 9 years the crop returns have averaged about 11 tons per acre, the increase occurring principally during the last 7 years. Good cultivation apparently aids greatly in the remedial treatment of the soil. Dressings of lime in various forms, with the exception of gas lime, proved effective, especially in the fourth and later years of their application, when the value was almost doubled. Lime mud, costing only one-third as much, was almost as effective as lime. The percentage of badly diseased, in comparison with that of slightly diseased, swedes was progressively decreased.

The New York apple tree canker, L. R. HESLER (*Proc. Ind. Acad. Sci., 1911, pp. 325-339, figs. 7*).—This disease, known since 1900 to be caused by *Sphaeropsis malorum*, is figured and discussed in some detail.

Preventive measures have not been carefully worked out, but clean culture with tree surgery is recommended. It is said that the latter has been applied at a cost of about 25 cts. per tree, the procedure including removal of all diseased bark, disinfection with corrosive sublimate, and painting over the wounds with coal gas tar. Wounding should be carefully guarded against at all times. Spraying is of value only in preventing the first attack and is usually of doubtful practicability even then. Cutting off diseased limbs below the point of attack and permitting a new shoot to form has been found practicable. Selection of nonsusceptible varieties is thought to be a means of possible value.

A new parasite on *Polystigma rubrum*, A. BONDARTSEV (*Izv. Imp. St. Peterb. Bot. Sada (Bul. Jard. Imp. Bot. St. Petersb.), 13 (1913), No. 3, pp. 59-64, pl. 1, figs. 2*).—A description is given of *Glæosporium polystigmaticolum* n. sp., a fungus found living parasitically upon *P. rubrum* on plum leaves. The *Glæosporium* attacks the other fungus and causes the spots to dry and fall away.

A technical description of the new species is given.

A conidia-bearing species of *Septobasidium*, N. PATOUILLARD (*Compt. Rend. Acad. Sci. [Paris], 156 (1913), No. 22, pp. 1699-1701, figs. 2*).—The author reports having received from Brazil, Cochín China, and elsewhere specimens of *S. albidum* on branches and leaves of cultivated species of citrus.

The fungus does not seem to be parasitic upon the plant, but seems to occur symbiotically with species of *Coccidæ*. Cultures made showed that it developed conidia abundantly, and this has enabled the author to determine not only the complete life cycle of the species but also some of its affinities.

Comparing with this species that described by Mangin and Viala (*E. S. R., 15, p. 165*) as *Bornetina corium*, the author concludes that it belongs to the order *Septobasidiæ* and is very near the genus *Septobasidium*.

The acid spotting of morning-glories by city rain, J. W. HARSHBERGER (*Science, n. ser., 38 (1913), No. 981, p. 54*).—The author observed that following a light rain in September the wide open flowers of the common morning-glory growing on a lot in West Philadelphia several blocks from the railroad were more or less discolored. Wherever the drops of rain had touched the surface of the corolla, the purple color was changed to a pinkish red, and in the process of evaporation of the raindrops the acid of the drops was concentrated, so that later brown spots were left in the center of the pinkish red circles of discoloration. The explanation of the change in color is found in the change in the sap of the cells touched by the acid raindrops.

Similar spotting is believed to occur on leaves and fruits, due to the same cause. It is suggested that such spots may serve as points of entry of parasitic fungi, particularly those which are stimulated to growth by an acid condition of the cell sap.

Diseases of the violet, D. REDDICK (*Trans. Mass. Hort. Soc.*, 1913, pt. 1, pp. 85-102, pls. 2).—In connection with a brief discussion of the violet and its culture, the author summarizes the results of studies on root rot ascribed to *Thielavia basicola*; crown rot, to *Sclerotinia libertiana*; leaf spot diseases, to *Alternaria violæ* and *Phyllosticta violæ*; and gray mold of the leaves, to *Botrytis vulgaris*. A bibliography is appended.

The chestnut bark disease, E. M. STODDARD and A. E. MOSS (*Connecticut State Sta. Bul.* 178, pp. 19, pl. 1, figs. 8).—A description is given of the chestnut disease caused by the fungus *Endothia gyrosa parasitica* (E. S. R., 29, p. 552).

Thus far methods of control have proved only partially successful and are said to be not practicable for use in woodland. The spread of the disease may be checked, where individual specimens are infected, by cutting the trees, piling the bark and trash about the stumps, and burning them.

The authors claim that the presence of the disease in a stand of timber is in itself not sufficient reason for cutting, and that unless the trees are mature and the market condition is good it is better to give the uninfected trees a chance to grow as much as possible, especially where the blight has only just become apparent.

The discovery of the chestnut bark disease in China, D. FAIRCHILD (*Science*, n. ser., 38 (1913), No. 974, pp. 297-299).—The author reports having received from F. N. Meyer, agricultural explorer, U. S. Department of Agriculture, diseased bark and branches of chestnut trees which were turned over to the Office of Forest Pathology for identification (see below).

The chestnut blight parasite from China, C. L. SHEAR and N. E. STEVENS (*Science*, n. ser., 38 (1913), No. 974, pp. 295-297).—A description is given of cultures of the fungus *Endothia parasitica* made from material received from China.

The Chinese organism was found to be practically identical with the American in all its morphological and physiological characters and in the production of the typical chestnut blight and the pycnidial fructifications of the fungus. The evidence is thought to be sufficiently complete to allow the conclusion that *E. parasitica* occurs in China under conditions that would indicate that it is indigenous there.

Recent work on the chestnut blight, K. E. ROCKEY (*North. Nut Growers Assoc. Proc.*, 3 (1912), pp. 37-44).—In this paper the author gives an account of the history of the chestnut blight and describes the work of the Pennsylvania Commission in combating it.

Report of the Pennsylvania Chestnut Tree Blight Commission July 1 to December 1, 1912, W. SARGENT ET AL. (*Rpt. Penn. Chestnut Tree Blight Com.*, 1912, July-Dec., pp. 67, pls. 56).—A report is given of the organization of the Pennsylvania Chestnut Blight Commission, with a description of the field operations, pathological work, insect investigations, chemical investigations, tree medication, treatment of individual trees, geographic work, utilization of diseased trees, and demonstration work which it has undertaken.

Pathological investigations, F. D. HEALD and P. J. ANDERSON (*Rpt. Penn. Chestnut Tree Blight Com.*, 1912, July-Dec., pp. 40-45, pls. 15).—The investigations carried on by the pathologists of the commission have included a study and identification of specimens, the germination of spores, relation of insects to the chestnut blight disease, and nursery stock and dissemination.

In the study of the germination of the spores of the fungus it was found that the conidiospores germinate much slower than the ascospores. This is believed to explain the fact that a smaller percentage of successful infections is secured in artificial inoculations with conidiospores than with ascospores.

In connection with the work of the inspection of chestnut tree nursery stock, investigations were carried on to determine the possibility of carrying the chestnut bark disease by other nursery stock and the value of fumigation for preventing the spread of the disease. It was found that the usual fumigation of the nursery stock subject to this disease had no effect whatever upon the spores of the blight fungus.

In accounts of the field investigations in pathology, attention is called to the nonparasitic form of the fungus known as the Connellsville form (E. S. R., 28, p. 551). A brief account is given of studies on the dissemination of the fungus, and it is stated that ascospores of the perithecial stage of the fungus are more easily and rapidly dispersed than was previously believed. Agar plates placed upon the ground at a distance of 50 ft. from moistened pustules caught spores from them. It seems probable that spores would also be caught in wounds on trees, and this has proved to be the case in a number of instances where artificial wounds were made. Notes are given regarding the growth of the fungus during the winter, but while growth continued into October there was no increase observed in the cankers during November or December. Inoculations made during October, November, and December also showed no signs of infection.

A series of experiments to determine the longevity of spores was undertaken, in which the ascospores were found to retain their vitality for as much as 34 weeks. Conidia in the laboratory kept their vitality for 28 weeks, and the limit of vitality of none of these spores had been reached at the time the report was written.

Report of the physiologist, CAROLINE RUMBOLD (*Rpt. Penn. Chestnut Tree Blight Com., 1912, July-Dec., pp. 45-47, pls. 8*).—The work of the physiologist in connection with the control of chestnut bark disease has been to ascertain whether the growth of the chestnut blight fungus can be checked by the introduction of chemicals into growing chestnut trees, to determine whether the fungus can be killed by such processes, and whether the tree can be rendered immune to disease.

Various alkaline compounds were tested, of which lithium carbonate was the most toxic when applied to the spores. When injected into the trees none of the substances seemed to have any effect in retarding the disease, and many of them were destructive to the vitality of the tree.

The author in conclusion states that no general method for either killing or checking the growth of the chestnut blight fungus has been found. A successful method for injecting fluids into the trees has been devised, which, with modifications, can be used for injecting gases also. The present indications are that the heavy metals will not be of value in tree medication.

Preliminary note on birds as carriers of chestnut blight fungus, F. D. HEALD and R. A. STUDHALTER (*Science, n. ser., 38 (1913), No. 973, pp. 278-280*).—This is an account of investigations conducted in cooperation with the Pennsylvania Tree Blight Commission.

It is stated that "during the past spring the writers have devoted considerable time to the testing of birds as carriers of the blight fungus. . . .

"To summarize, our results show that the spores of the blight fungus carried by birds are pycnospores and not ascospores and that the maximum numbers are being carried during the few days following rain periods. We are also led to the conclusion that the pycnospores carried are brushed off from either the normal or diseased bark or both in the movements of the birds over these sur-

faces. This conclusion is supported by the fact that the birds tested were not carrying ascospores; that we have no evidence that ascospores are washed down the trees during the winter and spring months; also that following a rain period pycnosporos are to be found in abundance on the healthy bark below blight lesions."

Some problems in the treatment of diseased chestnut trees, R. G. PIERCE (*North. Nut Growers Assoc. Proc.*, 3 (1912), pp. 44-48).—The author describes some of the problems in the treatment of diseased chestnut trees and means to prevent reinfection.

Cutting out the cankered areas is advised, and it is stated that spraying with Bordeaux mixture in a rather extensive experiment has proved of value. Seventy trees were sprayed 20 times during the season with considerable success, while trees sprayed only 3 times were badly infected. One of the problems to be solved is the least number of sprays which will be effective in preventing reinfection. Spraying, it is thought, will only be practicable in the protection of a limited number of trees that are valued for sentimental or other reasons.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Life zones and crop zones of New Mexico, V. BAILEY (*U. S. Dept. Agr., Bur. Biol. Survey, North American Fauna No. 35, pp. 100, pls. 16, figs. 6*).—This publication is devoted mainly to a consideration of the life and crop zones of New Mexico with a view to affording practical information as to the areas in which certain specified crops will best thrive. The great range of altitude, together with an extent of nearly 6° of latitude, gives extremes of climate sufficient to include all of the life zones of North America above the Tropical and the lower division of Lower Sonoran, and to give a correspondingly wide range of agricultural possibilities.

The work includes a bibliography of publications bearing upon the life zones and distribution areas in New Mexico and a map intended to facilitate reference to the zones.

The natural history of the nine-banded armadillo of Texas, H. H. NEWMAN (*Amer. Nat.*, 47 (1913), No. 561, pp. 513-539, figs. 7).—This is a brief non-technical summary of the author's studies of the development, cytology, sex, heredity, etc., of *Dasypus novemcinctus texanus*. In nature the armadillo is preeminently insectivorous, stomach examinations of freshly caught wild animals having shown the remains of insects, chiefly ants, together with much earth and more or less vegetation.

The rats of Providence and their parasites, G. H. ROBINSON (*Amer. Jour. Pub. Health*, 3 (1913), No. 8, pp. 773-776).—This is a report of work conducted from July 18, to the last of December, 1912, in the city of Providence, R. I., at first confined to the water front but later extended to cover the entire city.

Of 341 rats examined 195 were found infested with a total of 2,053 fleas. Of these *Xenopsylla cheopis* constituted 75 per cent, *Ceratophyllus fasciatus* 22 per cent, *Ctenopsyllus musculi* 2.5 per cent, and *Ctenocephalus canis* 0.5 per cent. Twenty-one per cent of all the rats were found to be infested with mites (*Lalaps echidninus*) which became more numerous with the onset of cold weather. In one case the author found specimens of *Myonyssus decumani*, a species said to occur on *Mus decumanus* in Italy. The common rat louse (*Polyplox spinulosus*) was found on 24 per cent of the specimens. Open sores were found on 12 per cent of the rats.

No numerical study of the occurrence of internal parasites was made, except in cases where the liver was affected. This condition was found in 7 per cent of the rats and was due to the encysted form of the cat tapeworm (*Tania crassi-*

collis), and to the ova of an unknown parasite which is also found in rats in California.

Observations on the bionomics of fleas and rats in Java, N. H. SWELLEN-GREBEL (*Abs. in Rev. Appl. Ent.*, 1 (1913), *Ser. B*, No. 5, pp. 87-91).—This paper includes a report of experiments on the transmission of plague by blood-sucking insects, a flea census, the bionomics of *Xenopsylla cheopis*, and of rats, etc.

Leprosy-like disease in rats, F. TIDSWELL and J. B. CLELAND (*N. S. Wales Rpt. Govt. Bur. Microbiol.*, 2 (1910-11), pp. 49-51).—The authors report inoculation experiments made with material from a diseased rat (*Mus decumanus*) received for examination from Ultimo. No development of the bacilli after inoculation was secured in any of the guinea pigs or rabbits or in a monkey, while in rats the development was slight and occurred only in association with the material inoculated.

Examination of contents of stomachs and crops of Australian birds, J. B. CLELAND (*N. S. Wales Rpt. Govt. Bur. Microbiol.*, 2 (1910-11), pp. 192-208).—This is a report of investigations conducted in continuation of those previously noted (*E. S. R.*, 24, p. 353). The author here records the results of examinations of the stomach contents of 243 additional birds, making a total of 300 examined.

Annual report of the division of entomology for 1911, C. P. LOUNSBURY (*Union So. Africa Dept. Agr. Rpt. 1910-11*, pp. 335-356).—A report of the work for the year.

Notes on insect pests in Antigua, H. A. BALLOU (*Bul. Ent. Research*, 4 (1913), No. 1, pp. 61-65, pls. 2; *abs. in Agr. News [Barbados]*, 12 (1913), No. 294, p. 250, fig. 1).—This is a report of observations made during a visit to Antigua in December, 1912.

The insect pests of cotton in Burma, K. D. SHROFF (*Dept. Agr. Burma Bul.* 8, 1913, pp. 40, pls. 19).—This bulletin gives brief illustrated accounts of the various insect enemies of cotton in Burma.

Sugar cane pests in British Guiana, H. W. B. MOORE (*Rev. in Agr. News [Barbados]*, 12 (1913), Nos. 295, p. 266; 296, p. 282).—This report is based upon investigations carried on in British Guiana during the year 1912.

Insect pests of tobacco in Southern Rhodesia, R. W. JACK (*Dept. Agr. Rhodesia Bul.* 140, [1913], pp. 18, pls. 7; *abs. in Rev. Appl. Ent.*, 1 (1913), *Ser. A*, No. 8, pp. 287-289).—Cutworms are said to be the most injurious pests of tobacco in Southern Rhodesia.

The insect enemies of the pear, F. PICARD (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 31, pp. 136-145, pl. 1).—A brief summarized account.

The relationship of insects to disease in man in Australia, J. B. CLELAND (*N. S. Wales Rpt. Govt. Bur. Microbiol.*, 2 (1910-11), pp. 141-158).—A brief summarized account.

An intensive study of insects as a possible etiologic factor in pellagra, A. H. JENNINGS and W. V. KING (*Amer. Jour. Med. Sci.*, 146 (1913), No. 3, pp. 411-440, figs. 5).—The authors find the stable fly (*Stomoxys calcitrans*) to display certain salient characteristics which seem to qualify it for the rôle of a transmitter of pellagra.

The life history of the sheep tick (*Melophagus ovinus*), L. D. SWINGLE (*Wyoming Sta. Bul.* 99, pp. 3-24, figs. 4).—The results of the author's studies of the life history of this parasite are summarized as follows:

"The egg is fertilized and develops through the embryonic and most of the larval stage within the body of the female tick. It is laid as a larva which changes into the pupa stage about 12 hours later. (For convenience the term pupa is used in this paper to designate the offspring from the time it was born until it was hatched.)

"Pupæ require during the summer months from 19 to 23 days to hatch. In the winter—and at Laramie one can include the time from November 1 to May 1—from 19 to 36 days are required in case the sheep are kept in the barn. Were they turned outdoors in the cold wind, the probability is that in some cases the period might increase to 40 or 45 days. The period of incubation is greatly affected by the temperature, and therefore by the distance the pupæ are laid from the skin of the sheep, especially in the winter.

"The time required for females to reach sexual maturity is variable. Generally it will be from 14 to 30 days. But it is also true that certain factors might make the time much longer. Males and females are capable of copulating within 3 or 4 days after hatching.

"The whole life of the tick is spent on the sheep. They will not live more than a few days off their host.

"Female ticks were followed for 5½ months. Some probably live much longer. Many die earlier. There is a great mortality among the young before they take their first meal. The change from life in a puparium, supplied with food from the mother, to an independent existence on the sheep is naturally attended with considerable mortality.

"The number of pupæ laid by a female depends upon the length of her life. For a female living, say 4 months, the time one might regard as an average life-time, the number is about 10 to 12 pupæ. For one living 6 months, the number is 15 or more.

"The rate of pupa laying, counting from the time the first one is laid, is about one pupa every 7 or 8 days."

A list of Mallophaga found on introduced and domesticated animals in Australia, T. H. JOHNSTON and L. HARRISON (*Proc. Roy. Soc. Queensland*, 24 (1913), pp. 17-22).—This is a host list.

Grasshoppers, J. S. HOUSER (*Ohio Sta. Circ.* 137, pp. 127-134, figs. 10).—Several outbreaks of grasshoppers occurred in Ohio during 1912, the principal ones being at Upper Sandusky, Berea, and Athens. The author tested several means of control.

Coccobacillus erausquinii n. sp., parasitic on *Romalea miles* in Argentina, H. CULLEN and C. MAGGIO (*Bol. Min. Agr. [Buenos Aires]*, 14 (1912), No. 11-12, pp. 1368-1373, figs. 3; abs. in *Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 5, p. 825).—A detailed description is given of *C. erausquinii* n. sp., which was isolated by the authors from diseased locusts taken in January, 1912, in the Department of Las Colonias. It is said to have many characteristics which distinguish it from *C. acridiorum* (E. S. R., 27, p. 357).

The spruce aphid, A. HENRY (*Gard. Chron.*, 3. ser., 54 (1913), No. 1384, pp. 4, 5, fig. 1).—An outbreak of *Aphis abietina* is reported to have occurred during 1913 in the north and south of England and in Ireland, the spruce trees having been killed through being defoliated. Some species are not at all or very rarely infested by this aphid, others are infested but suffer little from its attack, while still others are entirely defoliated and subsequently die. The injury is not confined to young trees, although these are generally more severely injured than are the mature trees. In a large nursery in the south of England nearly the whole of the stock of *Picea sitchensis*, *P. pungens*, and *P. alba* is said to have been seriously damaged or killed, and many of the plants of the common spruce were reported killed in one of the northern nurseries.

A coccid injuring tobacco, G. LEONARDI (*Bol. Tec. Coltiv. Tabacchi [Scafati]*, 12 (1913), No. 2, pp. 75-80, figs. 4).—A mealy bug observed at Scafati in the Province of Salerno, where it attacks *Nicotiana glauca* and the hybrid

N. macrophylla × *N. collossea*, is characterized for the first time under the name *Pseudococcus nicotiana*.

The oyster-shell scale (*Lepidosaphes ulmi*), F. SHERMAN, JR. (*Bul. N. C., Dept. Agr.*, 34 (1913), No. 6, pp. 23, figs. 6).—A somewhat detailed account of this pest with remedial measures therefor.

"It is very prevalent throughout all the mountainous section of the State, and through the upper Piedmont or 'foothill' region, and is also recorded in several scattered localities as far eastward as the counties of Mecklenburg, Stanly, Rowan, Davidson, Chatham, Wake, and Granville. It is believed that on an average it is more severe in the more eastern localities than in the mountainous parts of the State."

[Parasites of the San José scale in Pennsylvania], H. A. SURFACE (*Amer. Agr.*, 92 (1913), No. 16, p. 325, figs. 2; *New England Homestead*, 67 (1913), No. 16, p. 305, fig. 1; *Rural New Yorker*, 72 (1913), No. 4226, p. 1151, figs. 3).—The chalcidid *Aphelinus fuscipennis*, an undetermined species of Anaphes and several other proctotrupids new to science are reported to parasitize highly the San José scale in the southeastern part of Pennsylvania. It is stated that in a large number of orchards where the fruit was rendered unfit for sale 2 years ago not a living San José scale nor specimen of specked fruit can be found at the present time.

[Parasites of the San José scale], L. O. HOWARD (*Tribune Farmer* [N. Y.], 13 (1913), No. 629, p. 3).—Identification of the parasites mentioned by Surface (see above) as playing an important part in the destruction of the San José scale in Pennsylvania has been made by the author, who finds them to be *Aphelinus fuscipennis*, *Prospaltella perniciosi*, *Signiphora nigrata*, and *Anagrus spiritus*.

Inquiry into the insecticidal action of some mineral and other compounds on caterpillars, H. MAXWELL-LEFROY and R. S. FINLOW (*Mem. Dept. Agr. India, Ent. Ser.*, 4 (1913), No. 5, pp. 269-327; *abs. in Rev. Appl. Ent.*, 1 (1913), *Ser. A*, No. 8, pp. 285, 286).—This paper reports in detail the results obtained in a large series of tests of poisons on insects. The experiments were carried on in an attempt to find substitutes for arsenicals and their practical outcome resulted in the selection of lead chromate as a standard stomach poison to replace arsenical poisons, and the selection of certain available dry paints which are recommended for application as deterrents on young crops. See also a previous note (*E. S. R.*, 24, p. 63).

The wattle bagworm (*Chalioides junodi*), C. FULLER (*Agr. Jour. Union So. Africa*, 5 (1913), No. 6, pp. 838-855, figs. 6; 6 (1913), Nos. 1, pp. 19-33; 2, pp. 198-215, figs. 40).—The insect here discussed, a native of South Africa, is widespread and not uncommon in the Provinces of Cape, Transvaal, and Natal. In this paper the author presents a discussion of the wattle industry, the physical and climatic features of Natal, the bagworm zone and injury, the monetary loss in relation to control measures, gross infestations, the life cycle, emergence and dispersal of the young, and the making of the bag.

Two Microlepidoptera injurious to chestnut, A. BUSCK (*Proc. Ent. Soc. Wash.*, 15 (1913), No. 3, pp. 102-104, fig. 1).—The two species here described as new are *Sesia castanea*, reared from the trunks of chestnuts; and *Ectoedemia castanea*, reared from small galls on young twigs of the chestnut.

A microlepidopterous enemy of the vine (*Cacœcia costana*), F. PICARD (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 22, pp. 678-684, pl. 1).—A brief discussion of this pest, its habits and injury, natural enemies, and means of combating it.

The caterpillars of the autumn generation emerge from hibernation in the early spring immediately after the buds swell, at which time they have attained

nearly half their growth. Their habits are much similar to those of the common pyralid which appears some weeks later, that is to say they consume the foliage of the vine and spin the leaves and young shoots with their webs. In southern France they develop very rapidly, in 1912 the caterpillars received at Montpellier from Camargue having pupated as early as April 20. The caterpillars of the following generation, which develop during the summer, feed upon the leaves and do not touch the berries, but may be the source of injury through severing the peduncles. The caterpillars of another generation partially develop in the autumn, hibernate, and emerge to attack the buds in the early spring. Thus 2 generations complete their development annually.

The tachinid *Nemorilla varia* is said to be an important parasite of this pest. Two hymenopterous parasites (*Pimpla alternans* and *P. examinator*) are also recorded. In combating the caterpillars, which are protected against insecticides, they must be destroyed by crushing with the hand.

Insects injurious to papaw apples, E. JARVIS (*Queensland Agr. Jour.*, 31 (1913), No. 1, pp. 33-35).—This paper relates to the injury caused by larvæ of the lepidopteran *Dichocrosis punctiferalis* by boring in the main stem, leaf stalks, and fruit. Although primarily an Indian corn pest, it also attacks custard apples, oranges, peaches, loquats, bananas, cotton, granadillas, and other fruits and seeds.

Observations indicate that the eggs are deposited on the leaf stalk near or at its point of junction with the main stem of the tree, and more rarely on the small fruits. Upon hatching out the larva penetrates the hollow stalk and after feeding for a time on its succulent base bores into the crown. When ready to pupate it crawls to some convenient crevice on the exterior of the main stem or among the stalks of the young fruit and buds and spins a loose silken web.

Applications of arsenate of lead at the rate of 1 lb. to 50 gal. of water are recommended. This should be applied just before the eggs are deposited and is directed principally against the early broods.

Injury to maple seed by *Nepticula sericopeza*, I. TRÄGÅRDH (*Skogsvårdsför. Tidskr.*, Fackafd., 1913, No. 4, pp. 291-303, figs. 10).—The author gives a historical sketch of this moth, its life history, and technical descriptions of its larval and pupal stages.

The caraway moth (*Schistodepressaria nervosa*), R. KLEINE (*Ztschr. Wiss. Insektenbiol.*, 9 (1913), Nos. 2, pp. 37-41; 3, pp. 69-72, figs. 7; 4, pp. 105-109, figs. 6; 5, pp. 143-148, figs. 2; 6-7, pp. 183-190, figs. 2).—A contribution to the biology and economic importance of this insect.

Surface caterpillar on tal lands, E. J. WOODHOUSE and H. L. DUTT (*Agr. Jour. Bihar and Orissa [India]*, 1 (1913), No. 1, pp. 1-19, pls. 4).—A report of work carried on in continuation of that previously noted (E. S. R., 25, p. 757).

Malaria: Cause and control, W. B. HERMS (*New York*, 1913, pp. XI+163, figs. 39).—This work deals in large part with the methods employed in controlling the anopheline mosquitoes which convey the malarial parasite. The work is based upon the author's experience in campaigns conducted in California.

Coccidiascus legeri n. g. and n. sp., an ascosporous parasite of the intestines of *Drosophila funebris*, E. CHATTON (*Compt. Rend. Soc. Biol. [Paris]*, 75 (1913), No. 27, pp. 117-120, fig. 1).—The author finds about 10 per cent of the pomace flies (*D. funebris*) to be parasitized by this yeast parasite.

Control of the orange maggot (*Trypeta ludens*), D. L. CRAWFORD (*Mexico Gulf Coast Citrus Assoc. Circ.* 1, 1913, pp. 5).—This is a summarized account of the orange maggot, a pest widely distributed over a large portion of Mexico.

The biology and morphology of some of the dipterous parasites of the caterpillars of the nun moth, F. TÖLG (*Centbl. Bakt. [etc.]*, 2. Abt., 37 (1913),

No. 14-16, pp. 392-412, figs. 29).—These studies relate to the tachinid *Parasctigena segregata* and the sarcophagids *Agria affinis* and *Sarcophaga falcitata*. The author has found the 2 sarcophagids to attack diseased caterpillars only.

Other African species of *Ceratitis*, M. BEZZI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, 7 (1913), pp. 19-26; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 4, p. 97).—An account of several species of *Ceratitis* reared by Silvestri from various fruits in French Guinea and Southern Nigeria.

Studies on the mouth parts and sucking apparatus of the blood-sucking Diptera, F. W. CRAGG (*Sci. Mem. Med. and Sanit. Depts. India, n. ser.*, 1912, No. 54, pp. 17, pls. 5; 1913, Nos. 58, pp. 33, pl. 1, figs. 2; 59, pp. 36+12, pls. 6).—The several parts of this work deal with (1) *Philmatomyia insignis*; (2) some observations on the morphology and mechanism of the parts in the Orthorrhapha; and (3) *Lyperosia minuta*.

The bionomics of *Stomoxys calcitrans*; a preliminary account, M. B. MITZMAIN (*Philippine Jour. Sci., Sect. B*, 8 (1913), No. 1, pp. 29-48; *abs. in Pub. Health Rpts. [U. S.]*, 28 (1913), No. 8, pp. 345, 346).—The studies here reported were made in connection with experiments in the transmission of surra by *S. calcitrans*. The paper deals with oviposition, hatching, larval life including cannibalism, the formation of the puparium, emergence of the fly, feeding habits of the adult, the occurrence in nature and resting habits, longevity, mating, and methods employed in keeping and feeding flies for laboratory purposes.

The paper is summarized by the author as follows: "The age at which *S. calcitrans* begins egg laying has been determined in bred flies to be 9 days. The maximum number of eggs produced by a single *Stomoxys* may be stated as at least 632 and possibly 820. As many as 20 depositions may be made in the lifetime of a female. The incubation period for these eggs is from 20 to 26 hours at a temperature of from 30 to 31° C. The larval stage under optimum conditions is usually from 7 to 8 days. The imago emerges from the puparium generally in 5 days. The fly of either sex takes its initial bite in from 6 to 8 hours after emergence. Flies of this species have fed experimentally on 17 species of vertebrates including mammals, reptiles, and birds. In feeding on live stock, *S. calcitrans* makes a wound with its labium from which nonbiting flies suck blood. The female may live at least 72 days and the male 94 days. The development of *S. calcitrans* varies considerably, depending upon the environment. Under optimum conditions, it is 12 days."

Biological investigations on *Stomoxys calcitrans* and the comparative biology of coprophagous flies, I. A. PORTCHINSKY (*Trudy Būro Ent. [St. Petersb.]*, 8 (1910), No. 8, pp. 63+90, pl. 1, figs. 107; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. B, No. 8, pp. 146-148).—This work first gives a résumé of the more important literature relating to the stable fly. In south Russia the life cycle requires from 32 to 38 days, the egg stage lasting 24 hours, the larval stage 14 to 24 days, and the pupal stage from 12 to 17 days. Mention is made of insects of the genera *Mellinus* and *Oxybelus* and a chalcidid parasite as enemies of the stable fly.

The second part of the work deals with the habits of some 33 species of coprophagous Diptera.

Further investigations of the transmission of pathogenic micro-organisms by native blood-sucking flies, SCHUBERG and BÖING (*Centbl. Bakt. [etc.]*, 1. Abt., Ref., 57 (1913), No. 14-22, pp. 301-303).—In experiments with streptococci the stable fly (*Stomoxys calcitrans*) transmitted a fatal infection to rabbits, not only immediately but even when periods of from 2 minutes to 24 hours had elapsed after the imbibition of the organism. *S. calcitrans* failed to convey

anthrax infection to the goat but did so in the case of 1 of 2 sheep experimented with.

Warble flies: Observations on the life history of the large warble fly (*Hypoderma bovis*) and rearing experiments, H. GLÄSER (*Mitt. Ausschusses Bekämpf. Dasselplage*, 1912, No. 4; abs. in *Centbl. Bakt. [etc.]*, 1. Abt., Ref., 56 (1913), No. 5-6, p. 163).—This paper brings together the biological studies of the author.

Warble flies: The egg and oviposition of the large warble fly (*Hypoderma bovis*), H. GLÄSER (*Mitt. Ausschusses Bekämpf. Dasselplage*, 1912, No. 3; abs. in *Centbl. Bakt. [etc.]*, 1. Abt., Ref., 56 (1913), No. 5-6, p. 163).—A report of observations of oviposition.

Æstrus ovis, its biology and relation to man, I. A. PORTCHINSKY (*Trudy Būro Ent. [St. Petersb.]*, 10 (1913), No. 3, pp. 63, figs. 28; abs. in *Rev. Appl. Ent.*, 1 (1913), Ser. B, No. 8, pp. 134-137).—An account of the life history and habits and methods of combating the sheep botfly.

The kangaroo botfly (*Æstrus macropi* n. sp.), W. W. FROGGATT (*Agr. Gaz. N. S. Wales*, 24 (1913), No. 7, pp. 567, 568, pl. 1).—The author reports having found a large number of kangaroos to be infested with this parasite. The larvæ are found in the mucosa of the upper part of the trachea.

Darkling beetle grubs injurious to tobacco, R. W. JACK (*Rhodesia Agr. Jour.*, 10 (1913), No. 5, pp. 705-708, pls. 2).—This article relates to the injury caused by the larvæ of *Tenebrionidae* to tobacco in Rhodesia.

Flea beetles and their control, A. GIBSON (*Canada Expt. Farms Ent. Circ.* 2, 1913, pp. 11, figs. 14).—This circular deals with the commoner species of flea beetles, including the spinach flea beetle (*Disonycha xanthomelana*), the triangle flea beetle (*D. triangularis*), the alder flea beetle (*Haltica bimarginata*), the grape flea beetle, the strawberry flea beetle (*H. ignita*), the bronze flea beetle (*H. evicta*), the potato flea beetle (*Epitrix cucumeris*), the red-headed flea beetle (*Systema frontalis*), the black-margined flea beetle (*S. marginalis*), the pale-striped flea beetle, the turnip flea beetle (*Phyllotreta vittata*), the horse radish flea beetle (*P. armoraciæ*), and the hop flea beetle.

Borers in native timber, R. W. JACK (*Rhodesia Agr. Jour.*, 10 (1913), No. 6, pp. 870-875, pls. 2).—This paper presents the results of experiments with preservatives.

Preliminary report of the finding of a new weevil enemy of the potato tuber, E. R. SASSCER and W. D. PIERCE (*Proc. Ent. Soc. Wash.*, 15 (1913), No. 3, pp. 143, 144, pls. 2).—Potato tubers (*Solanum tuberosum*) received from Peru, Bolivia, and Chili have been found to be infested with larvæ, pupæ, and adults of *Rhigopsidius tucumanus*.

The food plant of *Cleonus calandroides*, C. R. ELY (*Proc. Ent. Soc. Wash.*, 15 (1913), No. 3, pp. 104, 105).—This weevil has been found in Maryland to live in the roots of *Cakile endetula*.

The honey bee, W. D. WRIGHT (*N. Y. Dept. Agr. Bul.* 49, 1913, pp. 1383-1535, figs. 59).—A popular account of the honey bee is followed by brief articles by a number of authors on subjects relating to bee keeping.

Further report on the Isle of Wight bee disease (*Jour. Bd. Agr. [London]* Sup. 10, 1913, pp. 47).—In this report, which is supplementary to that previously noted (E. S. R., 27, p. 761), H. B. Fantham and Annie Porter present the results of further researches on the life history of *Nosema apis*, parasite carriers, examinations of pollen, honey, and wax, examinations of certain insects found in hives, and some observations on preventive measures (pp. 7-20); G. S. Graham-Smith and G. W. Bullamore discuss experimental infection with *N. apis*, further observations on the ways in which the disease may be spread, and further observations on treatment and prevention (pp. 21-34); and W. Malden

reports on the bacteriology of the disease (p. 35). A summary of investigations on the Isle of Wight bee disease (pp. 36-39), and a short account of Pasteur's investigations on the Nosema disease of silkworms, known as pebrine (pp. 40-45), follow. A bibliography of 24 titles is appended.

"Though it is highly probable that adult bees suffer at times from infectious diseases other than microsporidiosis, there can be little doubt that the widespread epidemic of recent years is mainly due to *N. apis*, and that preventive rather than curative measures will have to be adopted in order to limit its ravages."

The influence of temperature and moisture in fumigation, W. J. SCHOENE (*New York Sta. Tech. Bul. 30, pp. 3-11*).—The author reports upon a series of fumigation tests with potassium cyanid that were carried on with caterpillars of the brown-tail moth.

"A greater number of caterpillars survived the fumigations made at low temperatures than at higher temperatures; also fumigations made under humid conditions were uniformly more destructive to the larvæ than tests that were conducted in a relatively dry air. It is suggested that the difference in the results referred to above and the unusual resistance of the caterpillars to fumigation are due largely to the conditions incidental to hibernation, viz, the reduced moisture content and comparative inactivity of the insects."

Studies on the flagellates of the genera *Herpetomonas*, *Crithidia*, and *Rhynchomonas*, W. S. PATTON (*Sci. Mem. Med. and Sanit. Depts. India, n. ser., 1912, No. 57, pp. 21, pl. 1, figs. 2*).—Part 1 of this work deals with the morphology and life history of *Herpetomonas culicis*.

Color standards and color nomenclature, R. RIDGWAY (*Washington, D. C., 1912, pp. III+43, pls. 53*).—This work, consisting of 53 plates and 1,115 named colors, has been prepared with a view to the standardization of colors in their application to biology.

FOODS—HUMAN NUTRITION.

Influence of vegetables greened with copper salts on the nutrition and health of man, I. REMSEN ET AL. (*U. S. Dept. Agr. Rpt. 97, pp. 461*).—This report of the Referee Board of Consulting Scientific Experts presents in detail and discusses the experimental data obtained in the four series of investigations, summarized below:

Action of coppered vegetables on the health and nutrition of men, A. E. Taylor (pp. 9-208).—In these experiments normal young men were given mixed diets containing measured quantities of canned vegetables (notably peas) colored by copper, and the usual means were taken for measuring and analyzing the food and excreta during a period of about 3 months. The author summarizes the results as follows:

"The sole results that are clinically apparent in the subjects who ingested coppered vegetables in amount carrying up to 0.025 gm. of copper per day were possibly slight disturbance of the alimentary tract in one; possibly a slight increase in unresorbed nitrogen in a second; and possibly a slight reduction in the retention of nitrogen in the same individual. These data are of very doubtful value. The important fact that has developed in these investigations is the retention of copper. In all the subjects there was retention of copper, varying from individual to individual; in 1 subject very high considering the dosage, in 2 marked, in others low. These data parallel those that have been obtained by Professor Chittenden in animals. And, by analogy, we may infer that the retention was in the liver. By further analogy with lead and mercury, we may infer that a later redistribution may occur throughout the body.

I do not believe such a retention of a heavy metal can be a negligible matter even in the complete absence of present symptoms referable thereto; the whole tenor of the pharmacology of the heavy metals is contrary to such an interpretation. It will be only safe to exclude the retention of a metal like copper from the body. The retention in the case of the subjects of this experiment followed ingestions of copper that could not be called large. And apparently such retention might be expected to follow any ingestion of coppered vegetables. Under these circumstances the ingestion of vegetables colored with copper constitutes a menace to health."

Investigations of the effects of foods containing copper compounds on the general health and metabolism of man, J. H. Long (pp. 209-430).—The method of experimenting was similar to that used in the series conducted by Taylor, but the tests were continued for 4 months, made up of periods in which the copper dosage was varied. The author reached the following conclusions:

"During the lower dosage periods with copper in peas our records point to nothing which may be clearly applied in showing a harmful action of the metal. It appears that 100 gm. daily of peas containing 10 mg. of copper occasioned no marked disturbance beyond the distaste for the peas themselves. . . .

"About the only conclusion that we may legitimately draw from our low dosage experiments is that it may be difficult to feed enough peas—and this may be even more truly the case with certain other vegetables—to ingest copper in amount sufficient to produce a harmful action, as shown by clinical and metabolism observations.

"On the other hand, it is certainly true that copper sulphate as ingested with milk or beer through periods of some weeks is far from being harmless or free from easily observed effects. The copper in this form has apparently a physiological action distinct from that in the peas, and is unquestionably more active. . . .

"The addition of copper salts to peas and other vegetables has unquestionably the effect of suggesting to the user greater freshness than may be actually the case. While a very old pea may not be easily colored, it is true that peas which have begun to harden, and are far from the young or fresh stage, may be given enough copper materially to brighten their appearance. In this way it is clear, a certain kind of inferiority is covered up. . . .

"If, in the coppering of vegetables, an excess of the metallic salt is employed, an injurious action of this copper may certainly be affirmed. This danger is not a remote one, as a high copper content of cans of peas, with copper in the liquor as well as in the solid, has frequently been reported. In our laboratory experiments we have been able to show that an excessive amount of copper may be easily added and loosely held, in some other than the ordinary chlorophyll combination. As long as this possibility is present the whole coloring process, involving the use of a heavy metallic salt, must be looked upon with distrust, and must be considered as highly objectionable."

Absorption and distribution of copper when coppered vegetables are eaten, R. H. Chittenden (pp. 431-448).—In these experiments dogs and monkeys were fed with coppered vegetables in order to ascertain "how far copper is absorbed and to what degree it is deposited in the organs and tissues of the body when taken in small doses in combination with a food such as canned peas."

The conclusions of the author are that "when coppered vegetables are eaten with the food a certain proportion of the copper is absorbed and may be temporarily deposited in the liver. Even when taken in very small amounts, copper ingested in this way is prone to be absorbed in some degree, and thus constitutes a menace to good health. The conclusion seems obvious that vegetables which have been greened with copper salts are adulterated, because they con-

tain an added poisonous or deleterious ingredient which may render such articles of food injurious to health, whether taken in large quantities or in small quantities. In any event, there is an element of danger in coppered foods which, from a physiological standpoint, should not be ignored."

Histological examination of the tissues of dogs and monkeys, T. Smith (pp. 449-461).—This report gives the results of autopsies made on animals used in the feeding experiments conducted by Chittenden.

"A comparison of the gross and minute pathological conditions found in the 8 dogs shows a relatively slight yield from these methods of inquiry. A few facts, however, seem worthy of note.

"There has been no noticeable influence of the copper salts on the parasites in the digestive tract. Thus, dogs Nos. 1 and 3 were from the same litter and probably infested alike with worms at the start. But the autopsy showed no difference, although No. 3 had been fed with coppered peas and No. 1 with uncoppered peas. Parasites were also present in the other dogs fed with coppered peas. . . . In general it can be stated that the feeding with coppered peas did not have any decided vermifuge action. . . . Even the copper sulphate did not completely remove intestinal parasites.

"Very little, if any, appreciable differences were found between the controls on the one hand (Nos. 1 and 2) and the dogs fed with coppered peas on the other (Nos. 3 to 6). There was some fat in the liver of No. 3 as compared with his (control) brother No. 1. More than this can not be stated. There is, however, a distinction to be drawn between the dogs fed with coppered peas and those fed with copper sulphate. No. 8 was chloroformed before the close of the experiment because ill. In both No. 7 and No. 8 there was present an interstitial inflammation of the kidneys localized in the cortex, which was absent in all the others. The kidney lesions in Nos. 1 and 3 were, as already stated, due to parasites. In No. 8 there was also other lesions (extensive, fresh pigment in the spleen, leucocytosis)."

In the case of monkeys "the microscopic examination, as far as it went, did not reveal any differences between control and treated monkeys. It would seem as if this species of animal was better able to neutralize the poisonous action of copper sulphate than the dog."

From a study of these 4 reports, the Referee Board reached the following conclusion:

"Copper salts used in the coloring of vegetables as in commercial practice can not be said to reduce, or lower, or injuriously affect the quality or strength of such vegetables, as far as the food value is concerned.

"Copper salts used in the greening of vegetables may have the effect of concealing inferiority, inasmuch as the bright green color imparted to the vegetables simulates a state of freshness they may not have possessed before treatment.

"In attempting to define a large quantity of copper, regard must be had to the maximum amount of greened vegetables which might be consumed daily. A daily dose of 100 gm. of coppered peas or beans, which are the most highly colored vegetables in the market, would not ordinarily contain more than 100 to 150 mg. of copper. Such a bulk of greened vegetables is so large, however, that it would hardly be chosen as a part of a diet for many days in succession. Any amount of copper above 150 mg. daily may therefore be considered excessive in practice. A small quantity is that amount which, in the ordinary use of vegetables, may be consumed over longer periods. From this point of view, 10 to 12 mg. of copper may be regarded as the upper limit of a small quantity.

"It appears from our investigations that in certain directions even such small quantities of copper may have a deleterious action and must be considered injurious to health."

Beef meal (*Pure Products*, 9 (1913), No. 8, p. 405).—The product described is prepared by drying lean beef at a temperature below the boiling point of water. Part of the vapors, containing the aromatic substances, are collected, condensed, and added to the dried beef after it has been ground, and the mixture packed in tins and sterilized. The product may be used for soups or in combination with vegetables, and is said to have excellent keeping quality.

Nutritive value of the flesh of some foreign fish imported into France in recent years, A. C. HOLLANDE (*Bul. Sci. Pharmacol.*, 20 (1913), No. 7, pp. 405, 406).—Several varieties of fish are compared as to their composition and food value.

The decomposition and preservation of eggs, A. Kossowicz (*Die Zersetzung und Haltbarmachung der Eier*. Wiesbaden, 1913, pp. 74).—A historical review of the literature relating to the decomposition of eggs by yeasts, molds, and bacteria, with a summary and criticism of the results of the more important investigations along these lines, is given. A number of original investigations, carried out by the author to determine the micro-organism content of fresh eggs and the power of various micro-organisms to penetrate the unbroken shell of the egg, are reported.

A large number of fresh eggs were held for from 2 to 3 days at temperatures of 20 to 30° C., and their contents inoculated into various culture media. With very few exceptions, these eggs were found to be sterile.

Experiments in which eggs were exposed to various kinds of bacteria under conditions corresponding closely to those under which eggs are often stored in the household, in transportation, and in the trade, showed that bacteria could easily penetrate the unbroken shell of the egg and cause decay. This was especially true of the very common putrescible organism, *Bacillus vulgare*.

It was also shown by similar experiments that molds could penetrate the shell under conditions in which moisture and temperature played an important part. At high temperatures *Cladosporium herbarum*, and at low temperatures *Penicillium glaucum*, are the most active organisms which cause the molding of eggs. The shells of old eggs are more easily and quickly penetrated by the molds than those of fresh eggs. Some yeasts were also found to penetrate the shells of eggs.

Eggs, the shells of which were soiled by the contents of either fresh or decayed eggs, were found to be more susceptible to the invasion of micro-organisms than clean eggs.

An extended discussion is given of the various methods employed for the preservation of eggs, from which the author draws the conclusion that the most suitable method is cold storage in rooms which have been filled with carbon-dioxid, or else packing the eggs in milk of lime or in water glass.

Flour—the relationship of composition to bread-making value, F. T. SHUTT (*Canad. Miller and Cercalist*, 5 (1913), No. 8, pp. 176-178).—Experimental data are presented and discussed regarding the importance of determinations of protein, gliadin, and gluten in flour as factors in judging the value of flour for bread-making purposes.

The term "strength of flour" is also discussed at length.

Diastase in bread making, E. GALLI and A. CERADINI (*Rend. R. Ist. Lombardo Sci. e Let.*, 2. ser., 45 (1912), No. 10-11, pp. 546-555).—An investigation was carried out to determine the value of "diamalt" in bread making.

A study of its fermentative power as determined by comparative fermentation tests in glucose media with dough leaven, brewer's yeast, a mixture of leaven

and "diamalt," and a mixture of brewer's yeast and "diamalt," in which the loss of weight through the formation of carbon dioxide was regarded as an index of the resulting fermentation, indicated that the "diamalt" itself was a nourishing medium for ferments and assisted the action of leaven and hastened the alcoholic fermentation. Its action was always the same, regardless of the ferment causing the alcoholic fermentation.

Baking tests were carried out in which 6.5 parts per 1,000 by weight of "diamalt" were added to a part of the dough. A comparison of the bread to which the "diamalt" had been added showed it to have a better color and a greater loaf volume, and to have undergone a more complete and uniform fermentation than the bread to which no "diamalt" had been added. It also was crisper and had a better taste.

Maple sugar, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul. 258, 1913, pp. 15*).—The results of the examination of a number of samples are reported.

Maple sirup, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul. 259, 1913, pp. 21*).—Analytical data are given regarding a number of samples.

Brandy (*U. S. Dept. Agr., Food Insp. Decision 152, p. 1*).—This decision has to do with brandy adulteration and misbranding.

[Food and drug analyses], R. E. ROSE and A. M. HENRY (*Fla. Quart. Bul. Agr. Dept., 23 (1913), No. 3, pp. 220-229*).—Analytical data are given regarding a number of samples.

[Inspection of foods, dairy products, and feeding stuffs], W. D. SAUNDERS ET AL. (*Quart. Rpt. Dairy and Food Comr. Va., 1913, Mar.-May, pp. 68*).—This report contains the results of the sanitary inspection of dairies, creameries, bakeries, groceries, markets, slaughterhouses, hotels, restaurants, and ice cream and confectionery stores.

General and analytical data are given regarding the examination of foods and dairy products.

Composition of food materials, C. F. LANGWORTHY (*U. S. Dept. Agr., Office Expt. Stas. Food and Diet Charts 15, rev.*).—In revising these charts (*E. S. R., 24, p. 67*) a few errors have been corrected, data showing the composition of grape juice have been changed to conform to analyses of American products, and the energy values have been recalculated on a uniform basis of 4 calories per gram of protein and of carbohydrates and of 9 calories per gram of fat, and 454 gm. per pound.

The revised edition was issued by the Superintendent of Documents and the charts are distributed through him, none being available through the Department of Agriculture.

The ideal home cook book, LAURA DAVENPORT (*Chicago, 1913, pp. 256, pls. 6*).—This book, which is intended especially for the use of the young and inexperienced housewife and of those preparing food for a family of two or three, contains numerous recipes, household hints, and a collection of menus.

Cost of living of the working classes—report of an inquiry by the board of trade into working-class rents and retail prices, together with the rates of wages in certain occupations in industrial towns of the United Kingdom in 1912, F. H. MCLEOD (*London: Govt., 1913, pp. LXIII+398, pls. 3*).—In continuation of work previously reported (*E. S. R., 21, p. 464*), an exhaustive study was made of wages, rent, and cost of food and clothing in 88 cities and towns in the United Kingdom.

According to the conclusions drawn from the detailed statistical reports, it appears that while rents have on the average changed very little in the last 7 years, retail prices of articles of workmen's consumption have increased materially, though they are still at a lower level than about a generation ago. It is estimated that the probable average increase during the past 7 years in

the cost of workmen's rent, fuel, and clothing, taken together, is 10 per cent; the average value for rents being 1.8 per cent, for retail prices of food and coal 13.7 per cent, and for rents and retail prices combined 11.3 per cent.

When different towns were compared it was found "that the cost of living, as represented by rents (including rates) and the retail prices of the selected articles of food and coal was between 11 and 12 per cent higher in London than in the other 87 towns, taken as a whole. London is followed in this respect by the Scottish towns, and at the other end of the scale are the towns in the Midlands in which both rents and prices were at a low average. . . .

"The general level of prices of food and coal in the different towns showed a greater degree of uniformity than rents, the range of prices index numbers being from 90 to 108, whereas the range of rent index numbers was from 38 to 100."

The report as a whole presents the results of an exhaustive study of the subject and is an important contribution to the general subject of the cost of living.

Report on housing conditions and diet of high school pupils at Vevay, [Indiana], ADA E. SCHWEITZER (*Mo. Bul. Ind. Bd. Health*, 16 (1913), No. 6, p. 217).—A survey of living conditions of pupils who room in town during the school term and board themselves, with suggestions for betterment.

Principles of human physiology, E. H. STABLING (*London*, 1912, pp. XII+1423, figs. 564).—This volume is well illustrated and considers many of the topics from a chemical standpoint. Among its contents are the following: The structural, material, and energetic basis of the body; the contractile tissues; nerve fibers; the central nervous system; the spinal cord; the brain; the cerebral hemispheres; the physiology of sensation; vision; the organic sensations; the exchanges of matter and energy in the body; the physiology of digestion; intestinal digestion; the history of the foodstuffs; the blood; the physiology of the circulation; lymph and tissue fluids; the defense of the organism against infection; respiration; renal excretion; the skin and the skin glands; the temperature of the body and its regulation; the ductless glands; and the physiology of reproduction.

Water of imbibition of the tissues, A. MAYER and G. SCHAEFFER (*Compt. Rend. Soc. Biol. [Paris]*, 74 (1913), No. 13, pp. 750-752).—In a given species the tissues of a particular organ as well as the entire organism were found to have a remarkably constant water content. The amount of water contained in the different organs of the same animal varies, however, the greatest amount being present in the lungs, kidneys, muscles, and liver, in the order given.

Extended analytical data are presented.

Feeding experiments with mice, RUTH WHEELER (*Jour. Expt. Zool.*, 15 (1913), No. 2, pp. 209-223, figs. 6).—Experiments are described which are a continuation of those previously reported by Osborne, Mendel, and Ferry (*E. S. R.*, 28, p. 863).

Mice kept on an artificial diet containing a single protein (casein) were maintained in good health for 6 months, and for periods of from 1 to 5 months on a similar diet in which the casein was replaced by wheat protein. It was found that gelatin and zein could not replace more than half the protein, and in the case of gelatin a smaller proportion than this had to be used for successful maintenance.

Residual nitrogen of the blood before and during intestinal absorption of nitrogenous food, H. DELAUNAY (*Compt. Rend. Soc. Biol. [Paris]*, 74 (1913), No. 13, pp. 767-769).—Slight increases in the amounts of nitrogen titratable with formol and of amino nitrogen were observed in the arterial blood of fasting dogs after the ingestion of a hearty meal of meat. The blood of the portal

vein also contains more residual nitrogen than the arterial blood during the absorption of the meal.

The residual nitrogen of the blood before and during the absorption of a mixture of amino acids introduced into the intestine, H. DELAUNAY (*Compt. Rend. Soc. Biol. [Paris]*, 74 (1913), No. 13, pp. 769, 770).—The introduction into the ligatured intestine of a fasting animal of the mixture of amino acids resulting from the prolonged digestion of meat was followed within an hour by slight but distinct increases in the amounts of nitrogen titratable with formol and of free amino nitrogen present in the arterial blood, and by an increase in the amount of free amino nitrogen in the blood of the portal vein over the amount contained in the arterial blood.

The results of these experiments, together with those reported in the article noted above, lead the author to believe that there is, to some extent at least, a rapid and direct absorption of amino acids by the intestinal mucosa which is followed by a rapid decomposition of these compounds in the liver. This decomposition is indicated by the excess of amino nitrogen in the blood of the portal vein and the rapid increase of urea in the blood.

On fat absorption.—II, Absorption of fat-like substances other than fats, W. R. BLOOR (*Jour. Biol. Chem.*, 15 (1913), No. 1, pp. 105-117).—In continuation of previous work (*E. S. R.*, 27, p. 272), experiments were carried out with dogs to study the absorption of two classes of fat-like substances, namely, petroleum hydrocarbons and unsaponifiable esters (wool fat). These substances were similar to ordinary fats in most of their properties. They emulsified well with dilute alkalis, were soluble in fats and fat solvents, and melted below body temperature, but they could not be reduced to water-soluble form in the intestine.

In the author's opinion, "the slow passage of the fats from the stomach, the abundant provision for hydrolysis and for the absorption of the products of hydrolysis in the intestine, and the failure of absorption of fat-like substances which can not be changed to a water-soluble form, make it extremely probable that fats can be absorbed only in water-soluble form and that saponification is a necessary preliminary to absorption."

The pathological changes in pellagra and the production of the disease in lower animals, L. NICHOLLS (*Jour. Hyg. [Cambridge]*, 13 (1913), No. 2, pp. 149-161, pls. 2).—The results are reported of a histological comparison of lesions found in post-mortem examinations of human beings who had died of pellagra with the lesions produced in rats by adding to their food either sour maize or corn meal which had been inoculated with cultures of various organisms isolated from sour maize. From the similarity of these lesions, the conclusion is drawn that "corn meal acted upon by various organisms develops toxins which may produce in animals a condition analogous to pellagra in man."

Metabolism during mental work (*Rev. Sci. [Paris]*, 51 (1913), II, No. 7, p. 210).—A series of experiments carried out by A. Lehmann are reviewed, in which it was observed that the addition of a number of figures and the memorizing of a number of syllables resulted in an increase in the production of carbon dioxide. The greater the difficulty of the mental work, as measured by the degree of attention, the greater was the increase in the amount of carbon dioxide produced.

ANIMAL PRODUCTION.

Silage.—The stack system, W. DIBBLE (*Jour. Agr. [New Zeal.]*, 6 (1913), No. 6, pp. 609-615, figs. 4).—An article dealing with the New Zealand method of preserving silage by the stack system, in which the grasses or fodder plants for silage are cut when in the most succulent stage. The addition of $\frac{1}{2}$ lb. salt

per ton to the fodder is said to improve the silage. The size of the stack is usually from 30 to 50 tons, 40 cu. ft. being considered equivalent to 1 ton. A bottom layer of straw aids in preserving the silage. Success in stacking silage depends largely upon the first layer, which should reach a temperature of 130° F. within 24 to 48 hours after stacking. When this temperature is attained layers of from 3 to 6 ft. should be added daily, building the stack to a height of 20 ft. It is then topped with a platform and weighted with earth.

Mock silage, C. L. BEACH (*Vermont Sta. Bul.* 170, pp. 126, 127).—A report of the making of a mock silage from dry corn fodder. Three tons of water were added to 8 tons of shredded fodder. Five days later 2.5 tons more water were added, in another 3 days 4 tons more, a week later 2 tons, and daily waterings during the following week aggregating about 1,500 lbs. The final product contained about 25 per cent of dry matter. It is stated that the silage was relished and proved an efficient milk producer.

Cassava bran, a new feeding stuff, N. HANSSON (*K. Landtbr. Akad. Handl. och Tidskr.*, 52 (1913), No. 5, pp. 370-376; *Meddel. Centralanst. Försöksv. Jordbruksområdet*, 1913, No. 81, pp. 9).—This is a refuse material obtained in the manufacture of cassava starch, and claimed to be especially adapted for feeding fattening swine. Its composition, as shown by the average of 5 analyses, is as follows: Moisture 13.49, protein 2.6, fat 0.59, carbohydrates 80.94, and ash 2.36 per cent.

A feeding experiment was conducted with 20 pigs, separated into 4 groups, and weighing on an average from 47 to 48 kg. each, in which barley, peas, and cassava bran were compared when fed with whey, boiled Swedish turnips, and peanut cakes. The experiment proper lasted about 12 weeks, the resultant gain in weight being, for the group fed barley, 0.548 kg. per head daily; that fed barley and pea meal, 0.574 kg.; and that fed barley with cassava bran, 0.584 kg. One and one-tenth kg. of the cassava bran or 0.95 kg. of pea meal proved equal in feeding value to 1 kg. of barley. The bran was found to have a beneficial influence on the quality of the pork and on the slaughter weight of the swine.

[Feeding stuffs analyses], **B. E. CURRY and T. O. SMITH** (*New Hampshire Sta. Bul.* 165, pp. 28).—A report is given of 313 analyses of wheat bran, middlings, shorts, red dog flour, other wheat by-products, mixed feeds, calf meals, dried beet pulp, distillers' and brewers' grains, malt sprouts, flaxseed meals, gluten feeds, beef scrap, bone meal, cracked bone, meat meal, cottonseed meal, hominy feeds, molasses feeds, and poultry mixed feeds, together with the text of the law and notes regarding the inspection.

Commercial feeding stuffs, J. L. HILLS, C. H. JONES, and C. G. WILLIAMSON (*Vermont Sta. Bul.* 171, pp. 142-165).—Analyses are reported and discussed of nearly 500 samples of cotton-seed meal, linseed meal, distillers' and brewers' dried grains, buckwheat bran, gluten meal and feeds, molasses feeds, ground oats, wheat products, alfalfa meal, corn meal, hominy feed, dried beet pulp, cut clover, meat scrap, and proprietary and other mixed feeds. A discussion of low grade by-products and the manurial values of feeding stuffs is appended.

Bran, shorts, and chop-feed, A. MCGILL and G. H. CLARK (*Lab. Inland Rev. Dept. Canada Bul.* 254, pp. 53).—Analyses are reported of a large number of samples of bran, shorts, middlings, and chop-feed.

Heredity, W. BATESON (*Brit. Med. Jour.*, 1913, No. 2746, pp. 359-362).—A study of the subject of heredity with especial reference to the transmission and occurrence of characters in the human race.

Genetics and the agricultural college, J. A. DETLEFSEN (*Quart. Rpt. Kans. Bd. Agr.*, 32 (1913), No. 125, pp. 58-67).—A discussion of the advantages to be

derived from the introduction and study of the subject of genetics in the colleges of agriculture.

Prepotency in Airedale terriers, W. HAYNES (*Science, n. ser.*, 38 (1913), No. 977, pp. 404, 405).—Examinations of the records of the English and American Airedale stud books show that of 80 dog champions, 39 have been sired by champions and 61 have had either one or both grandsires as champions. However, only 27 of the 80 dog champions have produced champions and only 13 of these have produced more than one champion, these 13 producing 49 of the 149 champions of both sexes. Of the 80 dog champions, only 24 actually appear as grandsires of champions, and only 13 are the grandsires of 4 or more champions. Noting the prepotency of certain dogs as producers of champions it is shown that "those dogs who sired 2 or more champions almost invariably appear among those whose sons and daughters have produced more than 4 champions. The exceptional sires are also the exceptional grandsires." It is further noted that the 16 phenomenal producers are more or less closely related.

Miscellaneous information concerning the live stock industry, J. ROBERTS (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1911, pp. 269-300*).—This information includes a statistical review of the live stock market in 1911, with data as to prices for a series of years, wholesale prices of meat in home and foreign markets, and of our foreign trade in animals and animal products, legal standards for dairy produce (see page 776), contagious diseases of animals in foreign countries, and a list of state live-stock sanitary officials and accredited veterinary colleges.

[Report of] the annual meeting of the **American Meat Packers' Association, 1913** (*Nat. Provisioner*, 49 (1913), No. 13, pp. 160, figs. 35).—A compilation of speeches and addresses delivered at the convention of the American Meat Packers' Association held in Chicago September 22, 23, and 24. Among the topics included are the beef situation and cattle shortage, profits in beef producing, Australia and New Zealand as sources of meat supply, cold storage construction, the future meat supply, the manufacture of oleomargarine, and the relation of the board of trade to the packing industry.

The slaughter and consumption of food animals in the United States for the year 1909, J. ROBERTS (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1911, pp. 253-267*).—Data collected for the census of 1910 are given for the calendar year 1909. The distribution of meat slaughtering, the percentage of yearly slaughter of animals to the number on hand at the beginning of the year, the per capita consumption of meat and meat products, a comparison with that of the principal European countries, and similar topics are discussed. The small consumption of mutton in the United States is noted and discussed.

Australian frozen meat exports (*Pastoral Rev.*, 23 (1913), No. 9, pp. 915-918).—A statistical review of the Australian frozen meat trade with the United Kingdom, the United States, and other countries.

[**Live stock in Alaska**], C. C. GEORGESON, M. D. SNODGRASS, and J. W. NEAL (*Alaska Stas. Rpt. 1912, pp. 27, 28, 42-45, 56, 71-77, pl. 1*).—This report indicates that chickens may be successfully raised in Alaska, the Rhode Island Red appearing especially adapted for general utility purposes.

The Galloway breed of cattle at the Kodiak Station, as previously reported (*E. S. R.*, 28, p. 465), has proved its adaptability to Alaskan conditions. It is believed that crossing with the yak would increase hardiness and endurance. The station breeding herd of 86 head was wintered entirely on native hay and beach grass silage, and was in good condition until the volcanic eruption (see page 726), which necessitated the removal of the herd and caused some losses of cattle and sheep.

Swine raising around Fairbanks proved successful until the development of a disease which resulted in the loss of 75 per cent of the hogs. It has been demonstrated that hogs can be raised almost entirely upon potato culls and various root crops, together with a small quantity of corn to harden them off for market. Hogs on foot bring from 30 to 35 cts. per pound.

Sheep have done well when fattened on pasture. A pure-bred Cotswold ram has been secured and the ewes bred to lamb in May or June.

[**Animal husbandry work in Nebraska**] (*Nebraska Sta. Rpt. 1912, pp. XII-XIV, XVI-XVIII*).—The results of experiments with silage for beef production, previously reported (*E. S. R.*, 28, p. 572), are given.

In cooperative work with farmers of the State, one lot of 228 head of 870 lb. steers fed for a period of 89 days on blue grass pasture, the average daily grain ration consisting of corn 25.1 lbs. and cotton-seed cake 2.3 lbs., made an average daily gain of 3.49 lbs. per head. The pork produced from hogs following these steers amounted to 17,000 lbs., or 74.6 lbs. of pork per steer.

Relations existing between cattle breeding and the nature of the soil and climate of West Flanders, ZWAENEPOEL (*Min. Agr. et Trav. Pub. [Belgium], Off. Rural Raps. et Communs.*, 1913, No. 5, pp. 3-31, pls. 8, fig. 1; *Ann. Méd. Vét.*, 62 (1913), No. 8-9, pp. 425-458, pls. 6, fig. 1).—Measurements of cattle from 7 zones of West Flanders are followed by a discussion, with illustrations of typical cattle from each zone.

Cattle with "floating horns," P. DECHAMERE (*Ann. École Nat. Agr. Grignon*, 3 (1912), pp. 163-166, figs. 2).—Notes are given on cattle of French West Africa and other parts of Africa, the horns of which instead of being solidly fixed to the skull are movable, pendant, or floating. This condition is not invariably hereditary. Mobility of horns is considered by the author a form of transition toward the disappearance of the frontal appendages.

Milk required to raise a dairy calf, W. J. FRASER and R. E. BRAND (*Illinois Sta. Bul.* 164, pp. 437-458, figs. 6).—A series of 3 tests were conducted to demonstrate the value of milk in calf raising and to ascertain the minimum amount of milk necessary to insure to the calves a satisfactory start in life.

The first test was preliminary and indicated that during the first 2 weeks the calves must be fed a reasonable amount of milk containing about 3 per cent butter fat (this to be gradually changed to skim milk), the calves receiving practically all of their nourishment up to 8 weeks from the milk. Following this, a grain supplement may be fed.

The results of the second test indicated that it was possible to raise calves on a moderate amount of milk, the average amount required being 152 lbs. of whole milk and 435 lbs. skim milk. These calves made an average gain of 65 lbs. during the first 70 days of their lives.

During the third test more whole milk was fed, but it was found to be unnecessary. The cost of the milk fed each calf varied from \$1.61 to \$4.62, which is considered comparatively low.

The authors suggest the value of choice alfalfa hay in calf raising.

[**Sheep breeding and feeding experiments**], J. M. JONES (*New Hampshire Sta. Bul.* 163, pp. 24-28).—The sheep-breeding experiments continuing work previously reported (*E. S. R.*, 28, p. 267) are briefly reported upon. The results in the breeding of multi-nippled sheep have thus far been unimportant. Records are being kept with a view to studying the inheritance of twins in sheep. In experiments to determine the inheritance of wool color a black ram was mated with several white fleeced ewes, in all cases the black behaving as a recessive in the F_1 generation. The feeding trials have been previously noted (*E. S. R.*, 25, p. 475).

On the effect of castration upon horn growth in Herdwick sheep, F. H. A. MARSHALL (*Jour. Physiol.*, 46 (1913), No. 3, pp. XXIX, XXX).—With reference to work previously noted (E. S. R., 27, p. 70) it is stated that there has been no horn growth on the wethers since castration in 1911, thus substantiating the contention that "the development of the horns was dependent upon a stimulus arising in the testes."

Lamb fattening, T. W. LONSDALE (*Jour. Agr. [New Zeal.]*, 6 (1913), No. 6, pp. 586, 587).—In lamb fattening experiments at Moumahaki, New Zealand, 6 lots of 19 lambs each fed for 14 days produced the following average gains per head: On lucern, 9.36 lbs.; silver beets, 8.73 lbs.; rape, 7.84 lbs.; thousand-headed kale, 6.63 lbs.; chou moellier, 6.26 lbs.; and Buda kale, 3.68 lbs.

Reindeer in Russia, A. TZVETINOVITCH (*Pastoral Rev.*, 23 (1913), No. 9, pp. 870, 897, 898, figs. 2).—A brief discussion of the reindeer industry of northern Russia and Siberia. The domesticated reindeer takes the place of the horse, the cow, and the sheep for the natives of these regions.

The maintenance requirement of swine, W. DIETRICH (*Illinois Sta. Bul.* 163, pp. 409-435).—"Pigs differing in age, breeding, and conformation were used in 3 successive experiments, including 26 separate maintenance periods, to determine the amount of feed and the respective nutrients required for maintenance. The rations were gradually reduced during several weeks' time until quantities were reached that maintained a constant live weight. The coefficients of digestibility of the various nutrients were determined in most instances. In the last experiment, the nitrogen balance and the consumption and excretion of water also were determined to show whether the live weight was maintained by the substitution of water for body tissue.

"In the first experiment 4 pigs of mixed breeding were used in 4 separate periods at 50, 100, 150, and 200 lbs. live weight, respectively. In the second experiment 3 pigs were used: A Berkshire 3 years old, a Poland-China 1½ years old, and a Poland-China 1 year old. In the third experiment, 2 yearling Berkshire barrows were used which weighed 240 and 320 lbs., respectively."

In the first experiment the feed consisted of ground corn, wheat middlings, and skim milk. "The apparent maintenance requirement per day per 100 lbs. live weight of the 50-lb. pigs was 0.121 lb. crude protein, 0.434 lb. carbohydrate, 0.02 lb. ether extract; of the 100-lb. pigs, 0.124 lb. protein, 0.517 lb. carbohydrate, 0.026 lb. ether extract; of the 150-lb pigs, 0.131 lb. protein, 0.633 lb. carbohydrate, 0.033 lb. ether extract; of the 200-lb. pigs, 0.102 lb. protein, 0.549 lb. carbohydrate, and 0.033 lb. ether extract."

In the second experiment the feed consisted of ground corn, wheat, bran, wheat middlings, and tankage. "The apparent maintenance requirement per day per 100 lbs. live weight of pig A (509 lbs.) was 0.139 lb. crude protein, 0.402 lb. carbohydrate, 0.032 lb. ether extract; of pig B (375 lbs.), 0.112 lb. crude protein, 0.404 lb. carbohydrate, 0.032 lb. ether extract; of pig C (308 lbs.), 0.112 lb. crude protein, 0.401 lb. carbohydrate, 0.032 lb. ether extract."

In the third experiment the feed consisted of ground corn, red dog flour, tankage, and pork cracklings, and also included a fasting period of 8 days. "The apparent maintenance requirement per day per 100 lbs. live weight of pig A (415 lbs.) was 0.078 lb. protein, 0.228 lb. carbohydrate, and 0.029 lb. ether extract; of pig B (320 lbs.), 0.084 lb. protein, 0.213 lb. carbohydrate, and 0.036 lb. ether extract."

It is noted that the results of these experiments indicate that "the maintenance requirement of pigs is variable, i. e., one and the same pig, under different conditions, may maintain its live weight on distinctly different quantities of the same combination of feeds. This variation seems to be due to the plane of nutrition upon which the pigs have been maintained previous to the time of

making the maintenance experiment. The results also indicate that the maintenance requirement of pigs which previously have been kept on a low nutritive plane may be reduced to the following weights of nutrients per 100 lbs. live weight: Digestible crude protein, 0.10 lb.; digestible carbohydrates, 0.25 to 0.4 lb.; digestible ether extract, 0.03 lb. The calculated energy requirement for the above maintenance ration on the same basis would be about 1.12 therms."

Portions of the above work have been previously reported (E. S. R., 12, p. 77; 20, p. 1068; 22, p. 574; 26, p. 268).

Swine management in Texas, A. K. SHORT (*Texas Dept. Agr. Bul. 31, 1913, pp. 30, figs. 3*).—In this bulletin the author outlines the opportunities for successful swine raising in Texas, and reports an experiment carried on by a packing-house firm to determine the value of Kafir corn and milo maize as a hog feed as compared with Indian corn.

In this experiment the lot of shotes fed on equal parts of ground milo maize and Kafir corn, together with tankage, showed an average daily gain of 1.8 lbs. against the corn-fed hogs' gain of 1.57 lbs. The hogs ate more of the Kafir feed and a little more tankage, but "the net advantage in the matter of profitable feeding was with the Kafir hogs."

There is included in this bulletin a very thorough discussion of possible cropping systems suited to southern conditions; also plans for 3, 4, and 5 year rotations suited to profitable pork production.

Bacon for export, E. J. SHELTON (*Agr. Gaz. N. S. Wales, 24 (1913), Nos. 1, pp. 42-48; 8, pp. 693-709*).—This article treats in detail of the bacon type of hogs, their feeding, killing, dressing, and curing, and the processes of chilling, cutting and trimming, pickling, and storing. The author also discusses the grading, shipping, and prices realized from these products.

Biological searchlight on race-horse breeding.—IV and V, A study of the correlation between racing performances and breeding value in brood mares, J. B. ROBERTSON (*Bloodstock Breeders' Rev., 2 (1913), Nos. 2, pp. 81-91; 3, pp. 185-197, fig. 1*).—An investigation was made into the racing performance of 1,000 brood mares from the General Stud Book, of the dams of 175 high-class performers and of the dams of 189 classic winners, to determine the correlation between racing performance and breeding value in brood mares.

It is concluded that "the chance of breeding a classic winner is very much greater from those mares which have racing performances to their credit. Seventy-two per cent of the aristocracy of the turf . . . are from mares which showed some sort of form, and over 50 per cent are from mares which had considerable racing ability, and 26 per cent from mares which had great racing ability; but in the General Stud Book there are only 34 per cent of mares which have shown a vestige of form. Therefore it must be clearly evident that there is a very great correlation between the characters in a mare which make for racing merit and her power for reproducing those characters in her offspring." A previous investigation is said to have borne out these same conclusions.

Developing draft colts, W. A. COCHEL and B. O. SEVERSON (*Pennsylvania Sta. Bul. 122, pp. 3-13, pls. 2, figs. 11*).—This bulletin reports feeding experiments in which 4 stallion colts and 6 fillies were fed during 2 winter seasons and 1 summer season. The average initial weight of these colts was 589.87 lbs. The average gain per colt at the end of the first winter period of 168 days was 244.27 lbs.; at the end of the summer period of 196 days, 263.57 lbs.; and at the end of the second winter period of 168 days, 219.25 lbs. The average daily gain for the entire period was 1.36 lbs. The initial value of these colts was estimated at \$912.50, and the total cost of feed and labor at \$980.89.

Their estimated value at the end of the test was \$2,350, making the average profit \$45.66 per colt.

The biology of poultry keeping, R. PEARL (*Maine Sta. Bul.* 214, pp. 101-120, figs. 2).—This is a lecture delivered at Columbia University, January 31, 1912, which discusses in a general way the subject of poultry keeping with special reference to the small producer. Topics treated are the selection of good stock, the recognition of individuality, the importance of constitutional vigor, the advantages derived from systematic inbreeding, and the housing, feeding, and care of poultry.

Notes on the poultry and egg industry in the United States, H. M. LAMON (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt.* 1911, pp. 247-251, pls. 3).—The author discusses the marked growth of the poultry industry throughout the United States, especially in the Middle and Far West and the South. The price of poultry products has increased and there has been improvement in the methods of producing and marketing, partly due to the educational work of poultry papers, shows, etc. Breeding poultry as a business has developed rapidly, and has been fostered by large and small breeders alike.

Silver fox ranching in Prince Edward Island, J. E. B. MCCREADY (*Reprint from Charlottetown Guardian*, 1913, Sept. 29, pp. 3).—An account of this industry in which it is stated that there are 233 fox ranches on Prince Edward Island, where 2,480 foxes of all grades are in captivity, of which 1,325 are classed as silver-black foxes.

DAIRY FARMING—DAIRYING.

Report of the Vermont Dairymen's Association (*Rpt. Vt. Dairymen's Assoc.*, 43 (1913), pp. 128).—A compilation of addresses and discussions on general dairy topics, including cow-testing associations, selection and development of the dairy cow, nutritive value of feeding stuffs in relation to dairy feeding, etc.

Comparative experiments with chopped beets and beet tops for milk cows, A. ZAITSCHEK (*Landw. Vers. Stat.*, 78 (1912), No. 5-6, pp. 419-468).—This is an extended report of experiments carried on comparing the feeding value of chopped stock beets and of beet tops when fed to milk cows.

The general results indicate an increased flow from the feeding of chopped roots. Beet tops were also fed to advantage, both in the fresh and the soured stage, although digestive troubles are reported where too large a quantity is given, and this material must be used in conjunction with such feeds as hay, chopped straw, or oil cake. It is suggested that cows may receive an average of 35 kg. per day of the fresh tops and less of the soured feed; calves may receive from 15 to 20 kg.; sheep from 2 to 8 kg.; hogs from 4 to 6 kg. per 100 kg. live weight; and horses 20 kg.

Preliminary report on the milking machine, C. LARSEN, W. WHITE, and J. W. FULLER (*South Dakota Sta. Bul.* 144, pp. 205-232, figs. 7).—This bulletin includes a general description of the chief parts of the milking machine and treats of its operation.

Tests of the effect of the use of the machine on the yield of milk and milk fat were apparently negative when the machine was properly operated, although the results were not conclusive, except that cows producing a small quantity of milk "have their lactation period slightly shortened by the use of the milking machine," while the period of heavy producing cows was prolonged. It is further noted that the machine-drawn milk was free from sediment but contained more bacteria than did milk drawn by hand, due to the contaminated barn air drawn in by the machine. Cotton filters placed in the machine re-

duced the bacterial content. The soaking of the rubber tubes and teat cups in a 5 per cent solution of calcium chlorid saturated with sodium chlorid aided in reducing the germ content.

The interpretation of milk records, W. GAVIN (*Jour. Roy. Agr. Soc. England*, 73 (1912), pp. 153-174, figs. 9).—The author describes in this paper the results he has obtained in a statistical study of the milk records of 2,665 cows.

With a view to finding a single definite numerical value to express the inherent milking capacity of a cow, he arrives at a figure which he calls the "revised maximum" and defines as the maximum daily yield maintained or exceeded for not less than 3 weeks. It is shown that this figure "bears a close relationship to the total yield of a normal lactation, and shows rather less variation than that total. It is outside two of the most active external influences, viz. length of lactation and time of service, and it is suggested that general environment has a minimum effect upon it."

A table is included for correcting the figure for variations due to age, time of year, etc. It is also shown how this figure may be used in examining the inheritance of milk-yielding capacity.

The value of the escutcheon in judging dairy cattle, C. F. MOEAN (*Vermont Sta. Bul.* 170, pp. 125, 126).—Studies were made of the milk records of 88 cows to determine the value of the Guenon theory as to the relationship of the escutcheon to the milk flow of dairy animals. It is concluded that "the results showed nothing more than chance agreements." The wisdom of retaining this point on the judging score card of dairy animals is questioned.

Building up the dairy herds of Ohio (*Ohio Sta. Circ.* 135, pp. 79-100, figs. 11).—This circular deals in a general way with the grading and building up of the dairy herds of Ohio. It treats of the dairy type desired, the use of pure-bred sires, the value of community breeding and of breeding associations, and other related topics. A suggested constitution and by-laws for cooperative breeders' associations is appended.

Care of the dairy herd (*Ohio Sta. Circ.* 136, pp. 101-126, figs. 7).—This circular treats of the general care of the dairy herd, including such items as equipment, methods, care of the bull, health of the herd, and treatment of common dairy diseases.

Milk production in Canada, J. H. GRISDALE (*Canada Expt. Farms Bul.* 72, pp. 190, pls. 36, figs. 14).—This bulletin is an extensive popular treatise on dairying and dairy management. The main subjects treated are crop rotation, the dairy barn, selection of the dairy animal, milk production, care and feeding problems, dairy feeds and their feeding value, and sicknesses of the milch cow. There is included a chapter on Canadian feeding experiments with dairy cattle. These have been previously reported at various times.

The modern dairy, P. WAUTERS and MME. HAENTJENS (*La Laiterie Moderne. Paris, 1912, pp. 127, pl. 1, figs. 75*).—This volume deals with the general topics of the composition, bacteriological content, and care of milk, creamery practice, and the French methods of butter and cheese making.

The work of the department of milk science and dairy practice, R. W. RAUDNITZ and W. GRIMMER (*Separate from Monatsschr. Kinderheilk.*, 12 (1913), Ref., No. 1, pp. 71).—In this the authors discuss the scientific work that has been carried on relating to the composition of milk, enzym action in milk, bacteriology of milk, disease infection, and other related subjects.

Studies of the rennet coagulation of milk, R. M. WASHBURN and A. P. BIGELOW (*Vermont Sta. Bul.* 170, pp. 120, 121).—Believing that the rapidity of the coagulation of milk when rennet is added might afford some clue as to the relative merits of milks for infant feeding, a series of trials was conducted in late March and through April, using the milk given morning and night sepa-

rately by 2 cows well along in their milking periods. Coagulation in approximately 20 minutes at 100° F. was previously set as a norm or standard. In these tests 83 per cent of the samples coagulated in not less than 14 nor more than 23 minutes, 6 per cent in less than 14, and 11 per cent in more than 23 minutes. Leucocyte counts were made, but "no relationship was discovered between leucocyte and coagulation data; neither were there material variations observed when weather changes occurred, from warm to cool, or from rain to sunshine."

Trials were also made of abnormal milks. Bloody milk in the seventh milking after calving gave an acidity test of 0.26 per cent and coagulated in 3 minutes. Further tests of this milk and that from other cows soon after calving gave a coagulation figure ranging from 7 to 11. Milk from cows drying off, and due to calve some months later, gave a low acidity test, 0.17 to 0.19 per cent; one sample coagulated in 33 minutes, another in 3 hours and 20 minutes, and several not at all.

The effect of watery foods on milk (*Jour. Bd. Agr. [London], 20 (1913), No. 5, pp. 385-392*).—The conclusions of various investigators are summarized, and tend to show that the feeding of a ration containing a large quantity of water does not increase the percentage of water in the milk or reduce the percentage of fat. However, it is maintained that "many feeding stuffs have a specific effect on the yield and quality of milk; and that this effect is to be attributed to stimulating substances in the food, substances which have physiological rather than nutritive effects, and which are present in foods in small quantities only."

On the influence of fresh and dried distillery waste on the composition of milk and milk serum, S. WEISER (*Landw. Vers. Stat., 78 (1912), No. 5-6, pp. 409-418*).—This is a report of work supplementing investigations previously noted (E. S. R., 25, p. 479), and bears out the general conclusion that the composition of milk and milk serum is not materially affected by the feeding of substances of high water content.

Bacillus lactis fermentens, a spore-forming butyleneglycolic ferment of milk sugar, RUOT (*Compt. Rend. Acad. Sci. [Paris], 157 (1913), No. 4, pp. 297-299*).—This is a study of the morphological characters and properties of this bacillus, which is quite prevalent in milk especially in summer. It is of interest in view of the fact that it resists heat and has the property of fermenting milk sugar with the production of hydrogen and ketone compounds.

The control of bulk milk in stores, E. KELLY (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1911, pp. 237-246; Circ. 217, pp. 237-246*).—Report as to the market milk conditions of 47 representative cities of the United States indicated that 47.6 per cent of the milk selling stores dealt in the bulk product. Municipal control of the sale of milk is very irregular, ranging from lax restrictions in many cities to stringent control in others.

The disadvantages of bulk milk lie in the increased likelihood of adulteration and in the greater danger of bacterial contamination. Dipped store milk in St. Paul, Minn., was reported as showing a bacterial count of 8,206,000 per cubic centimeter as against 409,477 per cubic centimeter for wagon milk. These conditions are attributed to frequent contamination and lack of proper refrigeration. These stores were reported to be a serious problem in 63.81 per cent of the cities reporting.

A score card for use in the inspection of city milk stores is appended and recommended for use.

Legal standards for dairy products (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 218, pp. 2*).—This circular gives in tabular form the standards for dairy products as established by law in the several States and Territories. It includes

standards for milk, skim milk, cream, butter, whole milk cheese, condensed milk, ice cream (plain), and ice cream (fruit and nut).

The care of cream for butter making, G. H. BARR (*Canada Dept. Agr., Dairy and Cold Storage Comr. Branch Bul. 32, pp. 13, figs. 3*).—In experiments testing the value of different methods of keeping cream it was found that cream showed a much lower acidity test when kept in water and ice than when stored in either the cellar or a refrigerator. Cooling immediately after separating aided materially in preserving its flavor and retarding souring. Although it was possible to keep cream sweet for 84 hours, it developed an "old-cream" flavor which was imparted to the butter. Suggestions and instructions to patrons, creamery owners, and butter makers looking toward an improved quality of butter are included.

The control of the moisture content of butter, C. L. BEACH, A. P. BIGELOW, and R. H. ALLEN (*Vermont Sta. Bul. 170, pp. 121-123*).—In attempts to increase the moisture content of butter, it was found possible to produce uniformly good butter carrying a moisture content of very close to 15 per cent by using cream of about 25 per cent butter fat, churning in a barrel churn not more than one-third full (temperature at the outset 65° F.), and working 7 times on the Waters worker. The moisture content was not "materially affected by ordinary changes in technique save when the product was deliberately overchurned."

The determination of butter gains, HITTCHER (*Milk. Ztg. [Hildesheim], 27 (1913), No. 43, pp. 835, 836*).—In this article the author gives formulas for determining the overrun of butter from creams of varying fat content.

Cheese shrinkage, J. H. MONRAD (*N. Y. Produce Rev. and Amer. Cream., 36 (1913), No. 9, pp. 396, 397*).—The author ascribes the greatest shrinkage in cheese to the evaporation of water. This is due to a number of conditions, viz, the temperature in the curing room, the drafts and ventilation, the relative moisture in the air, the initial water percentage in the cheese from the press, the size (weight) and shape of the cheese, the texture, and the paraffining or other air-excluding devices. Other minor causes for shrinkage are the exudation of fat, loss of nitrogenous and mineral matter, and loss by molds, vermin, etc.

Cheese manufacture at the Lodi experiment station, C. BESANA and F. SAMARANI (*Ann. R. Staz. Sper. Caseif. Lodi, 1912, pp. 108*).—A compilation of articles dealing with cheese manufacture and creamery practice and with the manufacturing methods in vogue in Lodi, Italy.

Manufacture of Coulommier cheese, JANET McNAUGHTON (*Dairy, 25 (1913), No. 296, pp. 220, 221*).—Coulommier cheese is a French variety of soft cheese, which is easily and quickly made and requires only inexpensive equipment. The author describes in detail the method of making it.

The manufacture of Parmesan cheese (grana) and the selection of ferments, C. BESANA and F. SAMARANI (*Indus. Lait. [Paris], 38 (1913), Nos. 28, pp. 451-454; 29, pp. 466-469*).—This is a detailed account of the modern method of manufacturing Parmesan cheese, in which the author emphasizes the importance of choice of ferments and the use of sanitary methods of manufacture.

Desiccated milk, C. PORCHER (*Le Lait Desséché. Paris, 1912, pp. XVI+130, pls. 17, figs. 4*).—This volume treats of the manufacture of desiccated milk and milk powder and includes a discussion of the chemical and biochemical characters of milk powder, its digestibility and freedom from bacteria, a comparison with natural milk as a food for animals and man, and its advantages as a food for infants and convalescents.

A bacterial infection of condensed milk, L. A. THAYER (*Vermont Sta. Bul. 170, pp. 123, 124*).—A bacteriological examination of samples of condensed milk,

which had spoiled from 12 to 24 hours after condensing and canning, showed the presence of *Bacillus subtilus*. A sterilizing temperature of 125° C. for 15 or 20 minutes is recommended where the difficulty is encountered.

VETERINARY MEDICINE.

The Government's inspection and quarantine service relating to the importation and exportation of live stock, R. W. HICKMAN (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1911, pp. 83-99, pls. 11; Circ. 213, pp. 83-99, pls. 11*).—The first and greater part of this paper (pp. 83-96) relates to the work carried on in the inspection and quarantine of imported animals, the concluding part (pp. 96-99) with that of inspection of live stock for export.

The meiostagmin reaction and pregnancy, A. JULCHIERO (*Wiener Klin. Wchschr., 25 (1912), No. 43, pp. 1699-1701; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1913), No. 8, p. 711*).—The Ascoli and Izar reaction (*E. S. R., 25, p. 183*) was tried with the sera of pregnant women, with particular reference to the parallelism which has been observed between carcinoma and gravidity.

Of the 3 antigens, namely, methyl alcohol extracts of malignant tumors, of placentas, and of dried dog pancreas, the latter was most active. The blood sera of these subjects (women) gave a reaction from the sixth month until the end of pregnancy, and it was more pronounced than that obtained with the sera of normal subjects or the sera from nonpregnant patients not affected with diseases other than neoplastic. The pregnant patients affected with neoplastic diseases gave the highest reaction.

The content in antibodies of normal human colostrum and milk, RUTH TUNNICLIFF (*Jour. Infect. Diseases, 11 (1912), No. 3, pp. 347, 348*).—As certain differences in the amounts of hemolysins were noted in the colostrum and milk of immunized goats, some observations were made in order to determine whether the same difference occurs in normal human colostrum and milk. For this purpose the opsonic indexes for the staphylococcus, the streptococcus, and the tubercle bacillus were determined.

From the experiments the conclusion is reached "that normal human colostrum-milk contains more opsonins for the streptococcus, staphylococcus, and tubercle bacillus than does the later milk, but less than the blood serum. Since this is true, it would seem of great importance, as Famulener [*E. S. R., 27, p. 476*] points out, that the newly born infant should receive the colostrum-milk."

The bacteriological diagnosis of anthrax with the aid of the lung tissue, A. SZÁSZ (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 11 (1912), No. 1, pp. 43-64; abs. in Berlin. Tierärztl. Wchschr., 29 (1913), No. 11, pp. 199, 200*).—In the isolation of anthrax bacilli from old cadavers, much difficulty is often experienced in obtaining a culture. From the standpoint that oxygen is a necessity for the sporulation of the anthrax bacilli, lung tissue is used as a source for isolating these organisms. The method gave better results than those which are usually obtained with the spleen and putrefied tissues. It is advisable to heat the material to 63° C. before inoculating animals or culture tubes.

Infectious abortion of cattle and the occurrence of its bacterium in milk (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1911, pp. 137-183, pls. 7; Circ. 216, pp. 137-183, pls. 7*).—This work consists of 3 papers. The first an Introductory Statement, by A. D. Melvin (pp. 137, 138), discusses the investigations of the disease carried on by the Bureau of Animal Industry.

II. *The bacillus of infectious abortion found in milk*, E. C. Schroeder and W. E. Cotton (pp. 139-146).—This paper discusses the circumstances leading

to the discovery of the organism in milk, its artificial cultivation, inoculation tests, lesions caused in guinea pigs, and its occurrence in milk. It is shown that the organism has the udders of apparently healthy cows as its normal habitat and that it may be eliminated continuously for years in the milk of infected cows that no longer abort. A record is given of a cow which shows that the bacillus was present in the milk for a period of about 2 years and 9 months, and that there was no reason after 3 years to believe that it had disappeared from the milk. See also previous notes (E. S. R., 27, p. 281; 29, p. 500).

III. *Infectious abortion of cattle*, J. R. Mohler and J. Traum (pp. 147-183).—This paper describes and discusses the characteristics of the causative organism (*Bacillus abortus*); discusses the bacterial flora of the vagina; infectiveness; pathologic anatomy; symptoms; diagnosis, including bacteriologic, serologic, and allergic methods; and preventive and remedial treatment, including immunization. A bibliography of 29 titles is appended.

The artificial inoculation of cattle with the bacillus of contagious abortion, F. M. SURFACE (*Amer. Vet. Rev.*, 43 (1913), No. 6, pp. 624-628).—"The subcutaneous injection of a pregnant cow with a mixture of aerobic cultures of the abortion bacillus was followed by a typical abortion 52 days later. From this afterbirth and fetus a strain of organisms was isolated which grew steadily in the air on plain agar on the second day of incubation. In these respects the isolated organisms agreed with the strains injected and differed from any strains previously isolated. This in connection with Fabyan's evidence from guinea pigs [E. S. R., 29, p. 282] indicates that a cow may be artificially infected by the subcutaneous inoculation of this organism."

Investigations of the etiology of infectious abortion of mares and jennets in Kentucky, E. S. GOOD and L. S. CORBETT (*Jour. Infect. Diseases*, 13 (1913), No. 1, pp. 53-68, figs. 8).—This is a continuation of the work previously noted (E. S. R., 27, p. 580) reporting the isolation of the germ belonging to subgroup II of the colon typhoid group in 3 additional studs of aborting mares. "While we place the bacillus isolated at this laboratory in the same group as *B. enteritidis* and *B. cholerae suis*, it differs somewhat in cultural characteristics, and serum immune to the bacillus obtained from the mare does not agglutinate either *B. enteritidis* or *B. cholerae suis*."

"As it is evident that the etiological factors of the disease of infectious abortion of the cow and of the mare are different, we would suggest that the bacillus causing abortion in the mare be differentiated from *B. abortus* Bang by naming it *B. abortivus equinus*. From our investigations, normal horse serum agglutinates *B. abortivus equinus* in a dilution of 1:200, occasionally 1:300, while the serum of infected animals agglutinates from 1:500 to 1:5,000."

"The results of the work of Dr. F. M. Surface show that the serum of infected animals fixes the complement. A ewe and a sow, injected intravenously, and guinea pigs, subcutaneously, with pure cultures of this germ, aborted and the organism was recovered from the uterine exudates. An injection of 2 cc. of physiological salt suspension of *B. abortivus equinus* in a pregnant mare caused abortion in 10 days, with typical symptoms of natural infection. The organism was recovered in abundance from all the internal organs of the fetus, as well as the fetal membranes and uterus of the mare."

The technique of complement fixation in contagious abortion of bovines, A. THOMSEN (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 13 (1913), No. 3-4, pp. 175-179).—The author maintains that for the diagnosis of this condition by the complement fixation method it is not necessary to inactivate the serum previously, and that in some instances this is actually detrimental to the test.

If goat blood corpuscles and goat hemolysins are used as the hemolytic system, the amount of serum employed in the titration must be reduced.

Another contribution to the infection of man with cultures of hog erysipelas bacteria, A. KRIEGER (*Berlin. Tierärztl. Wehnschr.*, 29 (1913), No. 16, pp. 289, 290).—A description of a case in which the leg of a man accidentally came in contact with the needle point of a hypodermic syringe filled with erysipelas vaccine. Following the healing of the part, the upper portion of the arm became involved.

Malta fever, with special reference to its diagnosis and control in goats, J. R. MOHLER and A. EICHHORN (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1911, pp. 119-136, pls 4; Circ. 215, pp. 119-136, pls. 4*).—A general account is given of Malta fever, including its occurrence in Texas and New Mexico; etiology of the disease with a discussion of the tenacity and pathogenicity of the causative organism (*Micrococcus melitensis*); anatomical changes; symptoms; course and prognosis; diagnosis; and prevention and treatment.

The investigations show that the complement-fixation test can be utilized in the diagnosis of this disease, and, since the agglutination test is not always reliable for such purposes, that it is an important adjunct in the diagnosis of the disease.

The authors have experimented on infected goats with a vaccine prepared along the lines of antityphoid vaccine, the goats being treated 4 times at intervals of one week with such vaccine containing increasing numbers of killed bacilli. The practical value of the vaccine treatment is said to be very doubtful, inasmuch as it will be almost impossible to isolate strictly all animals giving a positive serum reaction and subject them to a vaccine treatment. Thus it appears that the hygienic and preventive measures are of far greater value in the control and possible eradication of the disease. "The control of the disease in a herd could be best accomplished by subjecting the blood serum of all animals to the combined agglutination and complement-fixation tests and destroying all reacting animals. . . .

"No thorough investigations have yet been undertaken as to the extent of Malta fever among the goats of Texas, New Mexico, and possibly in other States, and until this is determined it is impossible to decide upon a definite line of procedure for the control and eradication of the disease."

Paralysis in horses and in cows due to the ingestion of fodder, J. A. GILBUTH (*Proc. Roy. Soc. Victoria, n. ser.*, 25 (1913), No. 2, pp. 201-220).—This paper relates to a form of progressive paralysis in cattle, characterized primarily by an inability to ingest food, absence of rumination, more or less rapid emaciation, and early death, which for many years has been observed in Victoria, South Australia, and certain districts in Tasmania. Although apparently little observed in Victoria, the disease appears to be fairly common in South Australia, often assuming the character of a severe epidemic.

Feeding experiments with fodder consisting apparently of ordinary chaffed oaten hay with the addition of a slight percentage of oats and bran demonstrated the presence of some element which was the cause of the fatal results, although the nature of this element was not determined. The author concludes that it is due to some plant which horses are able to avoid while it is growing naturally, although even then many cattle can not or do not avoid it, and which even the horse does not detect when mixed with other ripe or dried plants, especially if chaffed and mixed. Whatever its origin, the essential cause of the paralysis is evidently some powerful poison of certain cells in the central nervous system.

Immunization tests in tetanus, J. R. MOHLER and A. EICHHORN (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1911, pp. 185-194*).—The purpose of these experi-

ments was to determine the smallest amount of antitoxin which is necessary to protect a susceptible horse against a fatal infection with tetanus.

Before undertaking the experiments on horses tests were made on guinea pigs, and in these it was found that from 0.25 to 0.5 cc. of washed tetanus cultures (freed from the toxin), mixed with a very small quantity of sterilized dirt, was sufficient to produce the disease. Without the dirt the disease could not be made to develop.

In the actual investigation 8 horses, which were in good health and fair condition, were used. During the tests they gained in weight. In order to conform to the conditions prevailing in nature, the part to be infected was first bruised by a severe blow with a blunt instrument, or by pinching the parts. The material used for inoculating the horses was a culture heated to 75° C. for 45 minutes in order to eliminate the toxin. Three cc. of the culture, to which was added a small quantity of dirt, was given to each of the 8 animals. Following the virus injection, 7 of the animals received an injection of antitoxin. Forty-eight hours after infection injections were again given to 2 animals, 68 hours after injection to 1 animal, 72 hours after injection to 2 animals, and 96 hours after injection to 2 animals. The amount of antitoxin given varied from 250 to 700 units. The eighth animal, which received no antitoxin, succumbed 9 days after passing through a cycle of symptoms classical for tetanus.

From the results it is "evident that a considerably smaller dosage of antitoxin could be employed for preventive purposes in horses than has been recommended for man. Only in 2 instances did localized tetanus develop subsequently to the antitoxin injection, and even these animals recovered. In these cases 250 and 400 units of antitoxin were injected, respectively. In consideration of the fact that all the horses used in these tests were quite aged and accordingly not nearly so susceptible as young animals, a somewhat larger amount of antitoxin would be necessary to prevent absolutely the development of tetanus in the latter class of animals. Accordingly, 500 units would seem to be sufficient for the prevention of tetanus in horses of any age. Since the cost of this product could be reduced considerably by employing this smaller quantity of antitoxin as compared with the former preventive dose of 1,500 units, its application in practice will probably become more general when the standard of 500 units is adopted.

"It will be observed that in these experiments the antitoxin was employed at different periods subsequent to the infection, and the results obtained indicate that the administration of the antitoxin even 96 hours after the infection will prevent the development of the disease. This is of considerable practical importance, inasmuch as frequently the veterinarian is called to attend an injured animal only after a considerable time has elapsed following the injury."

When considering tetanus antitoxin as a curative agent, it is pointed out that on the whole the results are unsatisfactory, and the cost is very high.

During 1911 a horse, which was previously used for hyperimmunization work with swamp fever, developed a rapidly progressing attack of tetanus. As antitoxin was not readily available, it was given subcutaneous injections of 20 cc. of a saturated solution of magnesium sulphate in each side of the neck. "The treatment was continued twice daily from September 27 to October 8, and then once daily from October 9 to October 19, with the result that complete recovery took place. In about 1½ hours after each of the early injections, the animal would show marked relaxation of the muscles, which seemed to indicate that the sulphate reduces the tonic spasms of the muscles rather than actually neutralizing the toxin. In this manner the animal is given an opportunity to form its own antitoxin, while its strength is being supported by the reduction of excitability and the ability to take some nourishment. In consideration of the severity of this case and the splendid results obtained from the treatment

with magnesium sulphate, the more extensive application of this treatment would be advisable in order to obtain further data from the results of a large number of cases."

The biochemistry and chemical properties of tuberculous sputum, R. EISELT (*Ztschr. Klin. Med.*, 75 (1912), No. 1-2, pp. 71-92; *abs. in Zentbl. Expt. Med.*, 2 (1912), No. 8, pp. 346, 347).—In the chemical examination of sputum, a weighed amount of sputum is diluted and 100 cc. treated with 10 cc. of a 3 per cent acetic acid solution; the mucin is filtered out, the filtrate neutralized with sodium carbonate, boiled, and the precipitate, which represents the protein bodies coagulated by heat, collected, washed, dried, and weighed. The albumoses are precipitated from the filtrate with zinc sulphate, the excess of zinc sulphate removed from the filtrate by boiling with water and barium carbonate, and the peptone estimated by Siegfried's iron method; the nitrogen rest is estimated by the Kjeldahl method.

Nitrogen coagulable by heat and albumoses were present in greater quantities in tuberculous sputum than in the sputum from other pulmonary diseases. The residual nitrogen consisted in the greatest part of leucin, tyrosin, and alanin

In determining the presence of enzymes in the sputum, it is extracted with 5 times its amount of alcohol-ether (2:1) for 2 hours, and the alcohol-ether removed by filtration. The residue is spread out on clay plates, dried, powdered, and 20 times its bulk of an aqueous solution of glycerin is added. The proteolytic power of the glycerin extract is then tested in an alkaline solution with casein, in a neutral solution with ricin, or in an acid solution with edestin.

Tests were also made with the optical method, and for the presence of lipases. It was noted that tryptases often occur in the tuberculous sputum, but that in many stages of the tuberculous process these enzymes are absent. In some febrile periods antiferments are present, which probably originate as a result of the destruction of the lung tissue.

The amount of enzymes present in sputum is directly proportional to the lipases and amino acids present, and indirectly proportional to the protein coagulated by heat.

Immunizing tests with tubercle bacilli, tubercle bacilli lipoids, and lipid-free tubercle bacilli.—Antigenic properties of lipoids, K. MEYER (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 15 (1912), No. 2-3, pp. 245-256).—By immunizing rabbits with killed tubercle bacilli, complement fixing antibodies are produced in large amounts. Antibody formation also takes place if the animals are immunized with lipid-free tubercle bacilli and with lipoids (cephalin). When produced with the lipoids, however, the immunity is less than that produced by the whole or intact bacilli, even though larger amounts of antigens are necessary, as measured by the complement fixation test. Specific antibodies are produced by immunizing with either the lipoids or the lipid-free bacilli, and are only positive with the antigen used for immunization or with the whole bacilli. The serum produced with lipoids does not react with the proteins of the bacilli, and the antigenic properties of lipoids can not be due to the presence of traces of proteins in the lipid extract.

Measles in cattle, B. H. RANSOM (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt.* 1911, pp. 101-117, pls. 7, figs. 2; *Circ.* 214, pp. 101-117, pls. 7, figs. 2).—This paper discusses the life history of the unarmed or beef tapeworm (*Tania saginata*), its occurrence, its location in the body, methods of inspection for discovering cysticerci, diagnosis, vitality of cysticerci, disposal of infested beef, and eradication of the disease. The beef tapeworm and its cystic stage, unlike the pork tapeworm, are comparatively common in the United States, the explanation being that raw or rare beef is very frequently eaten. The available

figures indicate that nearly one per cent of all the cattle slaughtered in the United States at the present time are affected with measles.

On necrobacillosis with special reference to balanitis (sheath disease) in sheep, F. TIDSWELL (*N. S. Wales Rpt. Govt. Bur. Microbiol.*, 2 (1910-11), pp. 52-59).—This paper reports studies of the occurrence and nature of this disease, the characteristics of the necrosis bacillus, pathogenesis, dissemination, etc.

Influence of the mode of penetration, cutaneous or buccal, of *Stephanurus dentatus* on the localization of this nematode in the body of swine and on its development, P. N. BERNARD and J. BAUCHE (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 1, pp. 74-76).—This nematode parasite, known as the kidney worm of hogs, occurs principally in the adipose tissue which envelops the ureters and kidneys. It is met with in the liver with variable frequency and exceptionally in other viscera. At Hue (Anam) the authors found 34.6 per cent of the hogs inspected at slaughter to be infested. The parasite was found about the ureters and kidneys in all of 100 infected animals and in the hepatic parenchyma in 4 animals. Its presence in the lungs is said to be extremely rare.

In cysts developed in the perirenal and periureteral cellulo-adipose tissue the parasites are found in pairs, the females being filled with eggs. These cysts open into the lumen of the ureters through fine canaliculi. The centrifuged urine showed the presence of eggs with from 8 to 16 blastomeres in 141 of 411 animals. Examinations made of feces have never shown the presence of eggs in the alimentary canal. Thus it appears that the parasites mate in the periureteral cysts and that the eggs pass out in the urine. The eggs readily develop in Looss' medium, the embryo maturing in 24 hours at a temperature of from 25 to 35° C.

The authors' investigations show that this parasite can enter the body of the hog (1) through the skin, and (2) through the digestive tract, and that specific lesions correspond to both of these modes of penetration—perirenal and periureteral cysts in the former and hypertrophic cirrhosis of the liver in the latter. The observations of the disease both naturally and experimentally brought about establish clearly that the periureteral localization of *Stephanurus* is a necessary part of the life cycle of this nematode. The cutaneous penetration alone is compatible with the conservation of the species.

Investigations of the number of red and white blood corpuscles in the sound horse, SCHÜTZE (*Ztschr. Tiermed.*, 16 (1912), No. 7, pp. 275-290; *abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 11, p. 198).—The average for the 35 horses (22 geldings and 13 mares) studied by the author was 7,401,727 erythrocytes and 9,629 leucocytes per cubic millimeter. The average percentage of the various forms of leucocytes was for lymphocytes 10.30, mononuclears 18.94, transitionals 8.59, polynuclears 56.64, eosinophils 5.12, and mast cells 0.39.

A note on some interesting results following the internal administration of arsenic in canker and other diseases of the foot in horses, J. D. E. HOLMES (*Agr. Research Inst. Pusa Bul.* 32, 1912, pp. 5).—During the course of experimental treatment of surra in horses it was found by the author that arsenious oxid has a curative effect upon canker, thrush, sand crack, and brittle hoof.

The life history of *Sclerostomum bidentatum*, R. STIER (*Arch. Wiss. u. Prakt. Tierheilk.*, 39 (1913), No. 4-5, pp. 435-448, pl. 1).—The author's investigations lead him to conclude that "almost every horse is affected by one or more aneurisms of the ileo-ceco-colic arteries and their branches. The average internal length is 6.5 to 7.0 cm. (2.6 to 2.9 in.), the internal circumference about 5 cm. (2 in.) and the average thickness of the wall 4 to 5 mm. ($\frac{1}{4}$ to $\frac{1}{2}$ in.). One or several thrombi with parasites are always found in the aneurisms in winter, and not rarely in summer. The number of parasites is smaller in

summer than in winter. The worms found in the blood vessels are always young forms of *S. bidentatum*. The most abundant intestinal nodules and the majority of sexually mature parasites are found in the cecum. *S. edentatum* is more frequently found in the intestine than *S. bidentatum*, and the latter is far commoner than *S. quadridentatum*. I have not found young forms of *S. bidentatum* in the intestine and its membranes. On this account and for several other reasons I conclude that the parasite develops up to a certain stage in the mesenteric artery, and only reaches the intestinal wall by way of the blood stream about the period of sexual maturity."

A bibliography of 76 titles is appended.

Eye worm of chickens, E. V. WILCOX and C. K. McCLELLAND (*Hawaii Sta. Press Bul.* 43, pp. 14).—This parasite, known as Manson's eye worm (*Oxy-spirura mansonii*), is said to be very commonly met with in Honolulu. An examination of chickens in all parts of the town indicates that the worm is found in nearly every flock. In cases of slight infestation there may be only 2 or 3 worms in each eye, while in badly infested flocks the number of worms may reach 50, 60, or more in each eye of infested fowls.

It appears from the investigations here reported "that the eggs of the eye worm of chickens are either laid in the eye from which they are immediately washed into the throat by the flow of tears down the tear duct, or are set free in the intestines by the disintegration of mature female worms which had passed down the tear duct, through the throat, into the intestines. The eggs hatch for the most part or altogether in damp soil, where they live until they attain at least one-third of their mature size, and then gain entrance to the eyes of chickens directly from the soil.

"The best treatment for the destruction of the eye worms in the eyes of fowls consists in anesthetizing the eye with a 5 per cent solution of cocaine and then lifting the nictitating membrane and dropping a 5 per cent solution of creolin directly into the inner corner of the eye, under the nictitating membrane. The fact that soil contaminated with the feces of infested fowls contains thousands of the larvæ of the eye worm makes it obvious that means should be taken to destroy the young worms in such situations. This may be accomplished by applying quicklime and keeping the soil as dry as possible, and also by the frequent cleaning and removal of all feces from infested yards, or, in the case of bad infestations, by keeping the birds on dry floors which can be frequently cleaned until the infestation has disappeared."

Tapeworms of waterfowl, WUNDSCHE (*Mitt. Fischerei Ver. Prov. Brandenburg. n. ser.*, 2 (1913), No. 12, pp. 178-183; abs. in *Internat. Inst. Agr.* [Rome], *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 4, p. 620).—Investigations have shown that the strap tapeworm (*Ligula simplicissima*), which in the immature stage infests roach and bream, occurs in large numbers in the waterfowl that frequent Müggel lake near Berlin.

RURAL ENGINEERING.

Report of the ministry of public works [concerning irrigation] (*Rpt. Min. Pub. Works Egypt, 1911*, pp. 43-287, pls. 23).—These pages contain reports of the inspectors-general of irrigation for Upper Egypt, Lower Egypt, and the Sudan, of the inspector-general on basin conversion works, and of the resident engineer on the heightening of the Aswan Dam and on Aswan Dam maintenance. The reports contain a large amount of irrigation, drainage, stream measurements, crop, and duty of water data with numerous profiles and illustrations.

Pumping plant irrigation, H. B. WALKER (*Dry Farming*, 7 (1913), No. 7, pp. 242-244).—In a review of the reports of irrigation by pumping in western

Kansas it is stated that the average operating expense for pumping irrigation water, exclusive of interest and depreciation, is about 4 cts. per acre foot per foot of lift, and that depreciation expense equals from 50 to 75 per cent of the operating expense, making the combined cost about 6 cts. per acre foot per foot of lift. Since only first-class machinery of standard make can be profitably installed it is stated that interest on the investment must also be considered. Because of the high operating expense it is considered doubtful if a lift exceeding 80 ft. is profitable for the ordinary field crops, but it is stated that sugar beets, vegetables, and small fruits may be profitably irrigated under somewhat higher heads.

Lazwell drainage-pumping plant (*Power*, 37 (1913), No. 24, pp. 846-848, figs. 4).—The mechanical and operating details of a novel pumping plant used to drain an area of approximately 50,000 acres of swamp land are described. In this plant three 54 in. centrifugal pumps are directly connected to 3 condensing engines. Three water tube boilers with induced draft supply steam at 150 lbs. pressure, superheated to 125°.

A novel system of monthly operation reports and general supervision is claimed to maintain the plant at its highest efficiency and economy.

Water conservation and drainage branch, H. H. DARE (*Rpt. Dept. Pub. Works N. S. Wales*, 1912, pp. 59-92).—This is a report on sewerage and storm water drainage, drainage of swamp lands, and water conservation operations in New South Wales for the year ended June, 1912. A large amount of data is given on well boring, water supplies, and water analyses.

Drainage experiments (*Min Agr. et Trav. Pub. [Belgium]*, Off. Rural Raps. et Communs., 1913, No. 5, pp. 75-77).—A plat of about 2½ acres of swampy compact ground was divided into 4 equal parts which were drained at respective depths of 1.4, 1.2, 1, and 0.8 meters, all drains being placed 10 meters apart. The plat drained to a depth of 1 meter yielded the largest and best crop of potatoes, with the plat drained to 0.8 meter second. The poorest yield was obtained from the deepest drained plat.

The principles of land drainage, J. L. HILLS, C. H. JONES, C. G. WILLIAMSON, and R. T. BURDICK (*Vermont Sta. Bul.* 173, pp. 275-312, pls. 2, figs. 13).—This article deals in particular with the underlying principles of land drainage as practiced in the North Atlantic States, including a discussion of the history and effects of drainage, types of drains and their construction, and a bibliography.

Explosives in agriculture, H. C. COGGINS (*Agr. Gaz. N. S. Wales*, 24 (1913), No. 5, pp. 375-380, figs. 2).—A discussion of the benefits of subsoiling to plant growth is followed by a description of the methods and results of experiments on subsoiling with gelnignite.

It is stated that the strength, depth, and spacing of charges must be determined in each case by experiment and will depend on the character and physical condition of the soil. In these experiments charges of ½ plug and 1 plug of explosives were tested, the holes being spaced 10, 12, 15, 18, and 20 ft. apart with, respectively, 435, 302, 194, 128, and 109 charges per acre. Exclusive of labor, which depends on local rates, the total costs per acre for the ½ plug charges were, respectively, \$12.85, \$8.89, \$5.81, \$3.74, and \$3.11; and for the whole plug charges \$18.15, \$12.55, \$8.26, \$5.01, and \$4.38.

A comparison of the different types of wearing surfaces used for the roadways of bridges (*Engin. and Contract.*, 40 (1913), No. 2, pp. 43-46).—Comparative data are given from a report presented by H. B. Browne at the Third International Road Congress at London on wood plank, wood block, sheet asphalt, stone block, brick, concrete, various types of bituminous pavements, macadam, gravel, and earth as used for roadways of highway bridges.

The final conclusions drawn from this investigation are (a) that where the support furnished to the surface is unyielding the wear of bridge surfaces of wood blocks, sheet asphalt, stone blocks, bricks, and other materials is no different from what it is under the same conditions on highways; and (b) that the construction of plank surfaces is rarely economical and its use should be generally abolished.

The determination of internal temperature range in concrete arch bridges, C. S. NICHOLS and C. B. McCULLOUGH (*Iowa Engin. Sta. Bul. 30, 1913, pp. 101, pls. 10, figs. 62*).—The results are given of a large number of experiments made on concrete arch highway bridges in Iowa with the object in view of determining the actual yearly range in temperature of reenforced concrete arch structures typical of the highway arch construction in that State and to investigate the comparative values of the factors affecting this range, such as prevailing winds, sun, shade, etc. The following conclusions are stated from the results of the experiments:

(1) The yearly range in temperature in a typical reenforced concrete arch structure is in that latitude not far from 80° F. (2) The relation between the depth of concrete covering at any point and the yearly temperature range may be obtained from the curve formula $y = 90 - \frac{53}{100}x$, in which y equals the yearly temperature range in degrees F. and x equals the distance from the nearest exposed surface in inches. (3) The amount of direct sunlight modifies somewhat the actual temperature in the concrete for a considerable distance into the interior of the mass. (4) The data on the rapidity with which the different portions of the structure respond to the external temperature changes show that in structures of this type the minimum temperatures are attained in time intervals from less than 1 day to 4 days after the atmospheric minimum. The interval depends upon the position of the portion of the structure considered, and is roughly proportional to the distance from the nearest exposed face. (5) Because of the high temperature in the concrete when it attains its set and the effect of atmospheric temperature on this maximum, other conditions being equal, the pouring of an arch ring at a temperature near the atmospheric mean annual temperature tends to lower materially the stresses in the ring induced by temperature variation. (6) When uninfluenced by other factors than atmospheric variation the rise and fall of an arch ring agree quite closely with theory. (7) The shrinkage of concrete, if unrestrained by reenforcing, amounts in 100 days after placing to 0.004 per cent. This induces bending stresses analogous to those produced by a temperature drop, but these are so modified by the initial stresses, due to shrinkage, that the chief effect is to cause a high compression in the steel on the compression side of the bending. When, due to other forces acting on a structure, a high compressive stress in the steel is encountered, the effect of this shrinkage should be carefully studied. (8) To render an arch ring structurally safe, provision should be made in that latitude for stresses induced by a temperature variation of at least 40° F. each way from an assumed temperature of no stress. Particular circumstances may demand that a greater variation be used, this remaining largely a matter of judgment with the designing engineer.

Comparative mortar tests with mixtures of normal consistency and work consistency (*Engin. and Contract., 40 (1913), No. 3, pp. 58, 59*).—In a paper by W. B. Reinke, presented before the American Society for Testing Materials, the results of comparative tests of mortars using both standard sand and natural sand, and in mixtures of the ordinary dry consistency of the laboratory and of the wet or fluid consistency common in actual construction are given. It is

considered that mortar of work consistency requires about $1\frac{1}{2}$ times as much water as for normal consistency.

The conclusions from these tests are as follows: (1) The less water required to produce a mortar of a given consistency the higher will be the strength developed by the sand. (2) The coarser the sand and the higher the silica content, other things being equal, the greater will be the strength developed. (3) In using sands of poor quality loss of strength at early periods can be largely overcome by using a dry concrete. (4) The loss of strength is confined chiefly to short periods, being practically overcome with time.

General conclusions on waterproofing methods for concrete structures by the committee of the American Society for Testing Materials (*Engin. and Contract.*, 40 (1913), No. 3, pp. 59, 60).—The conclusions deduced from 6 years' study of methods of waterproofing concrete are as follows:

Impermeable concrete may be obtained in the laboratory, but due to carelessness and inaccuracy of proportioning, mixing, and placing of concrete the reverse is usually true in actual construction. The majority of patented integral compounds to be added to the cement during mixture have little or no permanent effect and may injure the ultimate strength of the concrete. In general more desirable results are obtained from inert compounds acting mechanically in a void-filling capacity than from active chemical compounds. An effort should be made to secure concrete impermeable in itself and penetrative void-filling surface washes or coatings should be resorted to only as a corrective measure in case of cracks. Waterproofing compounds can not be relied on to counteract the effect of poor workmanship.

Denatured alcohol as a decarbonizer and engine cleanser, J. A. ANGLADA (*Gas Engine*, 15 (1913), No. 6, pp. 309-313).—Experiments with the use of denatured alcohol as a decarbonizer and cleaning agent for gasoline engines are described. Several engines containing bad carbon deposits were treated when both warm and cold. The combustion chambers were filled with denatured alcohol which, except in 1 or 2 obstinate cases, so softened the carbon in from 6 to 8 hours that it was easily removed and the smaller particles were blown out through the exhaust. It was found that heat is not necessary when using denatured alcohol as a decarbonizer, although it accelerates the action. It was also found that due to its cleansing action denatured alcohol is valuable in detecting imperfectly fitting pistons and piston rings.

[A steam engine for sun power plants] (*Sci. Amer. Sup.*, 76 (1913), No. 1958, pp. 29-32, figs. 14).—Inasmuch as the success of a sun power plant for irrigation pumping and other power purposes depends largely on the use of an efficient small-power steam engine, using steam practically at atmospheric pressure, the inventor of this system of pumping power development produced in conjunction with another engineer a low-pressure, slow-speed reciprocating steam engine adapted to the particular needs of the sun power plant. The economy claimed to be obtained by this engine is attributed to the combined effect of certain modifications and improvements in construction, which bring about a reduction of losses due to friction, valve and piston leakage, and initial condensation and clearance.

In further developments of small-power steam engines these modifications were applied to a small high-pressure and a small low-pressure engine having practically the same essential details. The high-pressure engine having a cylinder diameter of 16 in. and an 18 in. stroke was tested, both condensing and noncondensing, and the resulting steam consumption per brake horsepower hour compared very favorably with the results obtained under similar conditions from tests of several compound condensing and noncondensing engines of both higher

and lower power. Tests of the low-pressure engine having a cylinder diameter of 36 in. and a 36 in. stroke showed a steam consumption per brake horsepower hour which compared very favorably with the results obtained from tests of several higher and lower power exhaust steam turbines under similar conditions.

It is stated that the whole success of the small low-pressure engine depends on the availability and maintenance of a high vacuum, for which purpose specially designed air and hot well pumps are employed.

Windmill electric lighting and power, W. MANIKOWSKE (*North Dakota Sta. Bul. 105, pp. 39, figs. 21*).—This bulletin, a thesis for the degree of bachelor of science, calls attention to the convenience of electricity for lighting and power on the farm and describes a windmill electric lighting and power plant which it is claimed has given satisfactory operation for 2 years. The windmill, consisting of a 16 ft. wheel on a 20 ft. tower, is of the power type and drives a 1.4 kilowatt 150 volt, 1,800 r. p. m. special wound generator. A speed regulator so to control the varying speed of the mill as to produce a constant speed for generation is used, which consists essentially of a friction drum attached to the main drive shaft and 2 weighted arms, with friction shoes at one end, connected to the driving pulley, which transmit the power from the friction drum. When the speed increases so that centrifugal force causes the weights to fly outward the friction shoes are released from the friction drum, thus keeping the driving pulley below a certain speed.

The other necessary equipment is described and data are given from tests by E. C. Murphy (*E. S. R., 13, p. 195*) showing that a power mill is more efficient than a pump mill and that the load of the windmill must increase in direct proportion to the wind velocity if maximum efficiency is to be obtained. In addition to the automatic speed regulator the essential points to be considered for success with a windmill electric light and power outfit are stated as follows: A good wind velocity (20 miles per hour) must be at hand at least on an average of 6 hours during every week. An automatic cut-out and cut-in between the generator and storage battery is deemed necessary, as is also an automatic self-regulating switchboard.

Wind velocity data from North Dakota show the economic value of the windmill as a source of farm power in that State. By a comparison of costs of producing electricity by windmills and gasoline engines in North Dakota it is estimated that the total cost of a kilowatt hour as produced by wind power is about 5 cts. and by a gasoline engine 14.3 cts. The initial cost of the 2 outfits is considered practically equal.

Inaccuracies of indicators, J. G. STEWART (*Power, 37 (1913), No. 24, pp. 851-853, figs. 4*).—Extracts from a paper presented before the Institution of Mechanical Engineers at London give the results of experiments and descriptions of special apparatus employed in the determination of errors in indicators. It is shown that the indicator is subject to systematic errors of 2 distinct types: (1) The indicated pressure may not be that corresponding to the pressure in the cylinder, either because of friction or to inertia of the moving parts or to both; (2) the position of the drum may not be that corresponding to the position of the piston, because of stretch of the string or to straining in other parts of the indicator gear.

It is concluded that for important deductions from indicator diagrams the instrument should be tested and adjusted for these errors.

Mechanical safety devices in agricultural work, H. PUCHNER (*Landw. Hefte, 1913, No. 16-17, pp. 74, figs. 79*).—A large number of safety appliances are illustrated and described which may be applied to agricultural implements and machinery.

Stave silo construction, P. ROWE (*Dept. Agr. and Immigr. Va., Dairy and Food Div. Bul. 24 [1913], pp. 26, figs. 7*).—Practical instructions are given for the planning and construction of stave silos.

RURAL ECONOMICS.

Hay and history, V. G. SIMKHOVITCH (*Polit. Sci. Quart., 28 (1913), No. 3, pp. 385-403*).—The author describes the organization and history of the village community as found in many localities of Europe to-day, holding that anything so fundamentally characteristic as is the village community of European farming and its influence upon a permanent agriculture is of fundamental economic importance. He attributes the origin of the village community to simple economic necessity and its survival to prevailing methods of farming, treatment of soils, and crops cultivated. Considerable attention is given to the effect and influence of the introduction of hay upon agriculture as an industry and the part the village community has had in revolutionizing modern agriculture, showing that the introduction of grass seed and the various clovers into a system of crop rotation has had the effect of changing the basis of agriculture and to a large extent reversing the law of diminishing returns and soil exhaustion.

Indian wheat and grain elevators, F. NOËL-PATON (*Calcutta: Com. Intel. Dept., 1913, 2. ed., pp. II+134, figs. 28*).—Facts and data relative to expedients employed in India and other countries for the transportation of farm products are here presented, showing what effect the construction of elevators has had upon the growing of grain, expansion of trade and commerce, development of agriculture, and the building up of transportation facilities.

Cooperative stock shipping that pays, W. H. TOMHAVE (*Country Gent., 78 (1913), No. 36, pp. 1296, 1297, fig. 1*).—This article describes in detail the method of organization, manner of shipment, and progress made by an association of farmers in Meeker County, Minn., organized in 1908 for the purpose of selling live stock.

It is noted that 14 carloads were shipped the first year for gross returns of \$11,599. In 1912, 146 carloads, consisting of 6,380 hogs, 1,515 cattle, 1,972 calves, and 1,047 sheep, were shipped with a gross return of \$181,510.36, and a net return of \$171,190.59. The cost of handling per 100 lbs. was 33 cts. with hogs, 28.1 cts. with cattle, 56.5 cts. with calves, and 47.3 cts. with sheep.

The author states that the enterprise has resulted in a financial saving to the farmers, and has also resulted in better feeding and better breeding, created a greater demand for pure-bred sires, and encouraged better business methods.

The problem of rural credit or farm finance in the United States, J. L. COULTER (*Wis. Bd. Agr. Bul. 1, 1913, pp. 39; 63. Cong., Spec. Sess. U. S. Senate, Doc. 5, 1913, pp. 26*).—This document discusses and illustrates the necessity for rural credit in the United States, showing the land area, farms operated by tenants, and the present indebtedness among farm owners. Various systems of rural credit are discussed relative to their merits and defects. To aid in solving the rural economic problem the author recommends the adoption of better systems of registering land titles in the various States, the formation of land mortgage associations and credit unions, the elimination of the store credit system, and the adoption of amendments to state and national laws making it possible for state and national banks and trust companies to handle the class of securities which farmers are best able to furnish.

Home colonization in Norway (*Internat. Inst. Agr. [Rome], Mo. Bul. Econ. and Soc. Intel., 4 (1913), No. 7, pp. 129-139*).—In addition to a historical summary of the conditions and causes leading to the passage of an act by the

Norwegian Parliament in 1903 providing for long-time loans to laborers or farmers without means for the purpose of purchasing land and erecting buildings, this article describes the Norwegian Bank for Laborers' Holdings and Dwellings and gives an outline of the various kinds of loans granted, together with data as to results attained.

The bank is capitalized out of state funds, the capitalization amounting at present to 10,000,000 crowns (\$2,680,000). It obtains funds needed for loans by the issue of bonds guaranteed by the State. Loans for the purchase of small farms are granted at 3.5 per cent interest at most, either directly to persons without means on the security of the commune they inhabit, or to rural communes for the purchase and preparation of land for subdivision into allotments for laborers. Loans for the purpose of erecting buildings are made upon similar terms, except that a maximum of 4 per cent interest is allowed. Repayment of loans on land begins in the sixth year and on buildings in the third year.

Loans may be granted up to nine-tenths the value of the land purchased, and are to the borrower, who gives in exchange a mortgage bond. The part intended for buildings is paid in installments as the work progresses.

Loans for laborers' holdings since 1903 number 11,579, amounting to 16,098,430 crowns, and the loans for dwellings number 8,142, amounting to 11,161,057 crowns. Of the 3,053 loans granted in the year 1911-12, 1,613 were made to agricultural and industrial workmen on daily pay, the remainder being to artisans, servants, fishermen, schoolmasters, etc.

Agricultural cooperation for farm insurance, B. B. HARE (*U. S. Dept. Agr., Office Expt. Stas. Bul. 256, pp. 51-55*).—In this address the author discusses the economic necessity for farm insurance, outlines different forms of insurance and points out their method of operation; shows what has been accomplished in various sections by cooperative insurance; and outlines a plan by which such a system may be successfully operated in the United States. Among the advantages of cooperative farm insurance pointed out are the prevention of a serious pecuniary loss to a farmer or few farmers by distributing it among many; the tendency to keep the money paid for insurance in the rural districts; cheaper rates than those usually found in other systems of insurance; and the stimulus it gives to agricultural credit.

Among the essentials mentioned for a successful cooperative association for farm insurance are the following: (1) No salaried officers unless it be the secretary, officers being paid by the day or for the amount of services rendered; (2) no dividends; (3) a square deal for each member; and (4) the field of operation should usually be confined to a township or county.

Hail insurance, V. VERMOREL (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 34 (1913), Nos. 35, pp. 277-280; 36, pp. 308-315*).—This article presents the history and progress of hail insurance in France since 1882. Mutual insurance by local organizations confederated into regional organizations is reported to have been very successful. The operations of such associations are described at length. The establishment of a national insurance organization to work in cooperation with the regional organizations and to be financed by the national government is suggested.

[**Market conditions in Alaska**], J. W. NEAL (*Alaska Stas. Rpt. 1912, p. 48*).—It is pointed out in this report that the market for agricultural products in Alaska is very limited and should be thoroughly investigated before prospective settlers or newcomers engage in farming in the interior. "With the lack of necessary transportation facilities, and the sparsely settled communities in this country, the farmer must depend upon his own locality to consume his products, and it is easy for the supply to exceed the demand." It is estimated that the

demand exceeds the supply of native potatoes by 150 or 200 tons. About 6,000 cases of eggs are shipped in annually, the price ranging from \$15 a case in summer to \$30 or more in winter. The native eggs usually sell at double these prices, but the market demands imported potatoes in preference to native potatoes regardless of price, kind, or quality.

Letters from the settlers and reports from the seed distribution (*Alaska Stas. Rpt. 1912, pp. 82-89, pl. 1*).—Extracts from letters from a number of settlers, showing the results they have obtained in growing a number of crops and pointing out the drawbacks and possibilities of agriculture in Alaska, are here presented.

AGRICULTURAL EDUCATION.

Practical program for agricultural schools, D. SNEDDEN (*Jour. Ed. [Boston], 77 (1913), No. 26, pp. 733, 734*).—The author maintains that the preparation of boys from 14 to 18 years of age for the profitable pursuit of agriculture is the primary aim of the agricultural school, and that its curriculum and admission requirements should be in harmony therewith. Experimental and demonstration work should be merely incidental to the instruction, although some attention may be given to so-called demonstration work with crops and farm implements. Some agricultural schools will also become centers for short course instruction for working farmers and serve as a place where exhibits of modern machinery and farm products may be shown.

County agricultural high schools, with course of study, W. H. SMITH ET AL. (*Miss. Dept. Pub. Ed. Bul. 8, 1913, pp. 61-67*).—This deals primarily with the new course of study for these schools as worked out by a committee representing the county high schools in operation and those building. This course covers 4 years and includes 4 units of agriculture for boys and 4 units in home economics for girls.

The committee believes that the work of these schools should be county-wide. The schools "should lead in the establishment of cooperative industrial clubs for the raising and marketing of crops suitable to local communities," and "could send out men to do terracing, to check epidemics of disease, to treat sick animals, etc."

The committee recommends further the desirability of providing a teacher training department, organizing farm demonstration and other community work about each school as a center, and forming short term adult courses each winter.

Progress in agricultural education in New York State, A. D. DEAN (*N. Y. Dept. Agr. Bul. 47, pp. 1256-1264*).—The author reports that in January, 1913, there were in successful operation in New York 27 schools of agriculture, mechanic arts, and home-making, 11 of these beginning work in the fall of 1912. There were 1,704 boys and girls studying agriculture in the 27 vocational courses in agriculture in high schools, and 268 other pupils studying it in other courses.

Horticultural education, C. A. McCUE (*Trans. Peninsula Hort. Soc. [Del.], 26 (1913), pp. 48-52*).—After briefly describing the essential training necessary to become a successful horticulturist, and also making a plea for a larger development of the horticultural work at the Delaware College, this paper considers some of the ways in which horticultural knowledge is being disseminated in the United States at the present time.

One year's course in secondary agriculture, A. W. NOLAN (*School News and Pract. Ed., 26 (1913), No. 10, pp. 437, 438*).—The 6 main topics, discussed in their recommended order of sequence, are plants, animals, farm business and life, machinery, soils, and conditions of plant growth. A detailed outline is given.

Chemistry and its relations to daily life, L. KAHLENBERG and E. B. HART (*New York, 1913, pp. VII+393, pl. 1, figs. 129*).—This book is intended to represent a year's work for students of agriculture and home economics in secondary schools. The aim has been to make the subject matter thoroughly practical in character, with a maximum of useful facts and a minimum of theory.

One chapter is devoted to laboratory experiments, and lists of apparatus and chemicals and review questions are given at the end of each chapter.

Home economics—a bibliography for high schools (*Pullman, Wash., 1913, pp. 23*).—This pamphlet was prepared by the department of home economics of the State College of Washington. To the bibliography is added the outline of a four-year high school course in home economics.

List of references on home economics (*U. S. Bur. Ed. [Pub.], 1913, pp. 8*).—This publication contains an annotated bibliography with titles grouped under the headings of general, elementary schools, rural schools, secondary schools, and colleges and universities. A list is also given of the periodicals indexed in the bibliography.

Domestic science in the high school, BERTHA LATTA (*Purdue Univ. Dept. Agr. Ext. Bul. 7, 1912, pp. 12, figs. 2*).—This bulletin consists of 100 lessons, including recitations and laboratory exercises of 85 minutes each, in the study of foods, and an outline of the equipment used in the high school of Columbus, Ind.

Domestic science in rural communities, LUCY B. HAWK (*Purdue Univ. Dept. Agr. Ext. Bul. 8, 1912, pp. 12, figs. 2*).—An outline is given of the course followed and the equipment used in the study of food in the Mooresville, Ind., high school.

Approved methods for home laundering, MARY B. VAIL (*Hampton Leaflets, 6 (1913), No. 11, pp. 40, figs. 22*).—A discussion of home laundering and laundry aids.

Principles of bookkeeping and farm accounts, J. A. BEXELL and F. G. NICHOLS (*New York, Cincinnati, Chicago [1913], pp. 184, figs. 60*).—The aim of this volume is to supply the need of a text-book to be used in introducing bookkeeping and business methods in both graded and ungraded schools where there are boys and girls who are looking forward to agriculture as a life work.

School and home gardens, W. H. D. MEIER (*Boston, Chicago, New York, and London [1913], pp. V+319, pl. 1, figs. 157*).—This book is designed especially as a text-book for grammar grades in schools having school gardens. It gives definite instructions for arranging, planting, and caring for plants commonly grown in the house, yard, and garden. It also points out a number of difficulties which usually confront the student in plant cultivation and gives definite directions for obviating or overcoming them.

Boys' pig clubs in Alabama, C. S. JONES (*Educational Ex., 28 (1913), No. 7, pp. 28, 29*).—This article briefly outlines the objects and lines of work of these clubs, and of their relations to corn clubs and the farmers' cooperative demonstration work.

Each member must care for at least one pig, and keep records of the feed given and gain in weight. Prizes are given on the basis of (1) the best pure bred pig, (2) the best grade pig, (3) the greatest daily gains of pigs, cheapest cost of production, and best records, and (4) the best hog judge.

Proceedings of the seventeenth annual meeting of the American Association of Farmers' Institute Workers, edited by W. H. BEAL and J. HAMILTON (*U. S. Dept. Agr., Office Expt. Stas. Bul. 256, pp. 89*).—A detailed report of the proceedings of the meeting held at Atlanta, Ga., November 11-13, 1912, which has been previously noted (*E. S. R., 28, p. 94*), including the paper noted on page 790.

MISCELLANEOUS.

Twenty-eighth Annual Report of the Bureau of Animal Industry, 1911 (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1911, pp. 356, pls. 33, figs. 3*).—This contains a report of the chief of the Bureau for the fiscal year ended June 30, 1911, and numerous articles abstracted elsewhere in this issue. An appendix contains an account of the organization and work of the Bureau, a list of its publications in 1911, and rules and regulations of the Secretary of Agriculture relating to animal industry issued in 1911.

Annual Report of Alaska Stations, 1912 (*Alaska Stas. Rpt. 1912, pp. 96, pls. 17*).—This contains the organization list and a report of the several lines of work carried on during the fiscal year ended June 30, 1912. Meteorological data and accounts of the extensive tests with field and garden crops, of the live-stock operations, and of other lines of work are abstracted elsewhere in this issue.

Twenty-sixth Annual Report of Nebraska Station, 1912 (*Nebraska Sta. Rpt. 1912, pp. XXVIII*).—This contains the organization list, a review of the work and publications of the year, and a financial statement as to the federal funds for the fiscal year ended June 30, 1912, and as to the remaining funds for the fiscal year ended July 31, 1912. The experimental work reported is for the most part abstracted elsewhere in this issue.

Twenty-third and Twenty-fourth Reports of New Hampshire Station, 1911–12 (*New Hampshire Sta. Bul. 163, pp. 64*).—This contains the organization list; a report of the director for the biennial period ended October 31, 1912; financial statements for the fiscal years ended June 30, 1911, and June 30, 1912; departmental reports, the experimental work of which is for the most part abstracted elsewhere in this issue; a list of the publications of the station from 1888 to 1912; and meteorological data abstracted on page 722 of this issue.

Thirty-first Annual Report of Ohio Station, 1912 (*Ohio Sta. Bul. 249, pp. XXIX*).—This contains the organization list, a report of the board of control, a financial statement for the fiscal year ended June 30, 1912, and a report of the director summarizing the work and publications of the station during the year.

Annual report of the director for the fiscal year ending June 30, 1912 (*Delaware Sta. Bul. 100, pp. 14*).—This contains the organization list and the report of the director on the work and publications of the station. It includes a financial statement for the fiscal year ended June 30, 1912.

Press bulletins (*Ohio Sta. Bul. 249, pp. 899–922*).—Reprints of press bulletins on the following subjects: Chinch bugs; how to fight grasshoppers; Hessian fly warning; spurious catalpa stock; tree cankers in the apple orchard; fraudulent tree agents; alfalfa in Ohio; corn molds and ear rots in 1911—a seed corn warning; Christmas trees; destructive rodents; an advanced partial report of work begun in 1910 in orchard fertilization in southeastern Ohio; pasturing the farm woodlot; the periodical cicada or seventeen-year locust; why bad eggs; emergency hay crops; sugar beet culture in Ohio; burn the chinch bugs; the preparation of wool for market; Dwarf Essex rape for pork production; two early orchard pests; are the apple orchards worth saving; are apple trees grown for firewood or for fruit production; wheat field day at the Ohio Experiment Station; the climate of Ohio; insect pests of the wheat field; the soils of Ohio; and corn growers requested to look for diseased plants.

NOTES

Idaho University and Stations.—Dr. J. E. Wodsdalek of the zoological department of the University of Wisconsin has been appointed head of the department of zoology and entomology, vice Dr. J. M. Aldrich, whose resignation has been previously noted. Other appointments include Dr. A. R. Hahner as professor of veterinary science, F. W. Gail as assistant in plant pathology, Henry Fulmer as assistant bacteriologist, and R. A. Lamson as creameryman.

Kentucky Station.—Plans are being prepared for a new beef cattle barn to accommodate from 60 to 80 feeders.

The master bakers of the State held a meeting at the station during their recent convention at which the experimental bakery recently installed was dedicated. The Central Kentucky Millers' Association held its fall meeting at the station October 23. Much interest in station work was manifested at both these meetings.

Recent appointments include W. S. Anderson of the Kentucky Wesleyan College as assistant animal husbandman, to take up the study of inherited characteristics in horses and mules; D. D. Slade as superintendent of the poultry farm; Dr. E. W. Mumma and Dr. O. S. Crissler as assistants in the hog cholera serum production work; F. W. Hoffmann as assistant horticulturist; and W. V. Smith as assistant in animal husbandry. William C. Matthews, artist of the station, resigned September 1 to become instructor in scientific illustration in the college of agriculture of the University of California.

Minnesota University and Station.—The building that has served as a gymnasium and drill hall for many years is being remodeled for the use of the division of botany and plant pathology. A new gymnasium and a home economics building are to be built in the near future. The new agricultural engineering building is being occupied.

Dr. C. C. Lipp, assistant professor of veterinary science and assistant veterinarian, has resigned to become professor of veterinary science at the South Dakota College and consulting veterinarian in the station. C. W. Thompson, chief of the bureau of research in agricultural economics, has resigned to become head of the division of rural finance in the Rural Organization Service of this Department. Leave of absence for one year has been granted to C. P. Bull to serve as secretary of the National Corn Exposition and to W. H. Frazier, assistant professor of soils.

Francis Jager has been appointed professor in apiculture and apiarist and T. B. Hutcheson associate professor of plant breeding. Assistant professorships have been filled as follows: R. S. Mackintosh in horticultural extension work, A. H. Benton in farm management, W. G. Brierly in horticulture, Louise McDaniel in foods and cookery, William Moore in entomology, P. J. Olson in agronomy and farm management, Dr. L. D. H. Weld in agricultural economics, and G. A. Works in agricultural education. The following persons have been appointed instructors: E. C. Davis in agricultural education and C. C. Palmer in veterinary science; and as assistants Alex Carlyle in plant breeding, Mabel B. Trilling in textiles, Grace I. Williams in foods and cookery, J. J. Willaman in agricultural chemistry, C. O. Rost in soils, Dr. J. T. E. Dinwoodie in veterinary

science, Robert Wilson in forestry, and R. L. Donovan in demonstration work. F. E. Balmer has been appointed district superintendent of county agents, Estella L. Jensen mycologist, William Dietrich animal husbandman at the Crookston School of Agriculture, and Alva Wilson animal husbandman at the Morris School of Agriculture.

Nebraska University and Station.—Recent appointments include E. G. Woodward as adjunct professor of dairy husbandry and assistant in dairy husbandry in the station; Russell C. Jensen as instructor in dairy husbandry; H. B. Carpenter as adjunct professor of animal husbandry; H. M. Plum as assistant professor of agricultural chemistry; E. S. Bishop as assistant chemist of the station; Neal T. Childs of the Forest Service of this Department as instructor in forestry; Dr. Fred Johnson as superintendent of the hog cholera serum plant; Dr. S. W. Alford as assistant in serum production; George W. Hood as adjunct professor of horticulture; E. E. Brackett as instructor in agricultural engineering; Miss Hester M. Rusk as instructor in agricultural botany; and L. M. Gates as field expert in entomology, vice John T. Zimmer, resigned to accept a position in the Philippine Islands.

Association of Official Agricultural Chemists.—The thirtieth annual convention of this association was held in Washington, D. C., November 17-19, 1913, with the unusually large registration of 296. The presidential address, entitled *The Progress of the Chemistry of Agriculture*, was given by G. S. Fraps, who maintained that the agricultural chemist of to-day should specialize in one of the fields of agriculture, and that the agronomist and animal husbandman need the cooperation of the well-trained chemist in research problems. The abandonment of the teaching of agricultural chemistry in some institutions was deplored as a serious mistake. The Adams Act and the Food and Drugs Act were considered important steps in the progress of the sciences of agriculture and chemistry, and the demand for better investigators and more accurate research under the Adams Act was pointed out.

The report of A. J. Patten and L. S. Walker, referee and associate referee, respectively, on phosphoric acid, dealt with work on the analysis of slag, especially the purity of the magnesium pyrophosphate precipitate. The results obtained for total phosphoric acid were encouraging although not conclusive. A lack of agreement among the various analysts was attributed to the presence of iron and aluminum in the precipitate. The results with the volumetric method were in closer agreement than those obtained by the gravimetric method. For available phosphoric acid the molybdic acid, volumetric, and citrate of ammonium-magnesium-mixture methods were not in close agreement, and the provisionally adopted molybdate method seemed no more satisfactory than the others.

In a paper on *The Use of Sodium Citrate for the Determination of Reverted Phosphoric Acid*, A. W. Bosworth pointed out that neutral ammonium citrate does not, as is generally supposed, possess a selective power which enables it to separate dicalcic phosphate from tricalcic phosphate. In one-half hour at 65° C., 100 cc. of the official ammonium citrate solution was capable of dissolving 1.3 gm. of precipitated tricalcium phosphate. This was accompanied by a precipitation of calcium citrate, which led to the belief that the solvent action of the citrate solution is the result of a double decomposition started by the free phosphoric acid always present in aqueous solutions in contact with a solid phase composed of a phosphate. The differences between the results obtained with the ammonium citrate solution and with sodium citrate were no larger than those obtained by different chemists upon the same sample, and the duplicate determinations in all cases showed closer agreement with the sodium citrate. A paper noted on page 718 on *A Simple Method for Pre-*

paring Neutral Ammonium Citrate Solution, by A. J. Patten and W. C. Marti, was also presented.

The report of C. L. Hare as referee on nitrogen showed in general uniform and satisfactory results from the alkaline and neutral permanganate methods for determining organic nitrogen activity, and the ferrous sulphate-zinc-soda method for nitrogen in nitrates in raw materials and mixed fertilizers. The permanganate methods were approved for official adoption in 1914.

The referee on potash, H. B. McDonnell, reported work with the gravimetric cobalti-nitrite method, the perchlorate method, and the platinic-chlorid method with regard to the use of denatured alcohol for washing the potassium platinic chlorid precipitate, and as to the advisability of adding 3 cc. of hydrochloric acid to the aqueous solution of potash. Difficulty was experienced with the perchlorate method owing to the solubility of the perchlorate precipitate in strong alcohol and the insolubility of the impurities, including barium chlorid, in alcohol.

A paper on the perchlorate and gravimetric cobalti-nitrite method for the determination of potash was read by T. D. Jarrell. E. E. Vanatta, the associate referee on potash, reported preliminary cooperative work with M. F. Miller, of Missouri, on the availability of the potash in feldspathic fertilizers. Barley was grown in duplicate in stone pots containing 4 gal. of river sand and $\frac{1}{2}$ gal. of silt loam plus sodium nitrate, dried blood, acid phosphate, and a source of potash, either a maximum or minimum addition of feldspathic fertilizer, potassium sulphate, or potassium chlorid. The yields of straw and grain were greatest with potassium sulphate, but in only one case was the weight of grain obtained with the feldspathic fertilizer less than that obtained with potassium chlorid. Another study was made of the effect of cow manure in rendering insoluble potash of soils available as plant food, as measured by its solubility in boiling water. The sum of the potash extractions indicated that manure in combination with soil decreases the amount of water-soluble potash, and a moistened mixture seems to retain more of the potash than does a dry mixture.

The referee on soils, G. S. Fraps, reported that cooperative work with the Veitch method for acidity and laboratory work on methods for humus showed variation much greater than desirable, but that the method is considered useful. F. P. Veitch attributed the lack of uniformity in results to deviations from the instructions. The humus work showed that it is possible to obtain a clear filtrate from all soils examined according to O. C. Smith's procedure (noted on page 718), but that some colloidal mineral material passes through into the filtrate, which as previously noted (E. S. R., 25, p. 614) could be precipitated with ammonium carbonate. Bean's method (E. S. R., 28, p. 19) gave satisfactory results, but the soils tested required from 2 to 30 hours for washing and the filter became clogged.

W. H. McIntire and J. I. Hardy pointed out that if the Rather method were modified by filtering immediately after digesting 36 hours with 4 per cent ammonium hydroxid, and then adding 2.5 gm. of ammonium carbonate to the cylinder at the time of filtration on a Buchner filter with suction, a clear filtrate is obtainable after 15 cc. of cloudy fluid has passed through the filter. The average of 102 determinations with the same soil by the Rather method gave an ash content of 0.35 per cent, varying from 0.24 to 0.52 per cent, while the average of 81 determinations by the modification gave an ash content varying from 0.11 to 0.24 per cent, and an average of 0.18 per cent. The Rather method on standing gave a precipitate but none was noted with the modified procedure.

O. C. Smith, in a paper on humus determination, gave the results of a study of 3 soils with the official, original Rather, and modified Rather method. The association voted to discontinue the work on humus, to eliminate the official

method for humus and humus nitrogen, and to make a study of methods for determining organic carbon and nitrogen in soils.

A paper on the differences in lime requirement as indicated by the Veitch method, by A. W. Blair and H. C. McLean, brought out that the method may be depended upon within reasonable limits. C. H. Jones described a method for the determination of lime requirement of soils, which consists in rubbing up 5.6 gm. of soil with 0.5 gm. of calcium acetate (guaranteed reagent), adding enough water to make a stiff paste, mixing, and washing into a flask, taking care to keep the bulk of the fluid down to 160 cc. After shaking occasionally during a period of 15 minutes, make up to 200 cc., filter, and titrate 100 cc. of clear filtrate with decinormal sodium hydroxid solution. The number of cubic centimeters multiplied by 36,000 equals the pounds of lime (CaO) necessary for 2,000,000 lbs. of soil.

The associate referee on nitrogenous compounds in soils reported that lime seems to be the best agent known for the clarification of watery soil extracts in which nitrates are to be determined. The Chamot modification of the phenol-sulphonic acid method in most instances gave better results than the Gill method on the soil alone and in every case where potassium nitrate was added. The association approved the reduction method for nitrates and the method for nitrites and ammonia proposed by the associate referee as used for water.

W. H. McIntire and B. E. Curry, the referee and associate referee, respectively, on inorganic plant constituents, reported a further and final study of the Schreiber method for SO_3 , and an additional study of the official method for Fe_2O_3 and Al_2O_3 as extended to the determination of calcium and magnesium. As good results had been obtained during 4 years of study with the proposed molybdate method for iron and aluminum, which includes the determination of calcium, manganese, and magnesium, it was recommended for provisional adoption. Even when the amount of manganese present is many times that which occurs under normal conditions, there is only a slight occlusion. The association voted to extend the official method for iron and aluminum to include the determination of calcium and magnesium when only small amounts of manganese are present. It appears that the official method for sulphur can be simplified considerably if certain modifications are introduced into the procedure as recommended by Patten.

Results of a comparative and cooperative study of the zinc chlorid and iodine methods for lime sulphur as proposed by Harris (E. S. R., 25, p. 414) were reported by S. D. Averitt, the referee on insecticides. Another paper, dealing with the same methods, was submitted by R. C. Roark, and a method for the analysis of lime-sulphur solution was also presented by S. D. Averitt, with which an analysis can be made sufficiently accurate for commercial work in about 2 hours. The whole question of the analysis of the lime-sulphur solution was referred to a special committee consisting of W. F. Hillebrand, C. S. Cathcart, and H. H. Hanson, which is to examine the work presented by referees during the past 3 years. The referee also reported on the determination of water-soluble arsenic in lead arsenate, recommending that the method submitted be adopted as provisional and the present provisional method dropped.

The referee on water reported satisfactory results of a study of the proposed methods for strontium, iodine, and bromine, but these will be studied further. The remaining methods proposed 2 years ago were made official.

The report of the committee on the availability of phosphoric acid in basic slag, C. B. Williams, chairman, consisted chiefly in showing the progress made in the pot experiment study of the availability of phosphoric acid in basic slag as compared with that in sodium acid phosphate, double superphosphates, acid phosphate, and finely ground phosphate rock.

The committee assigned to consider the practicability of organizing for the study of the vegetable proteins suggested through its chairman, L. L. Van Slyke, the appointment of a small permanent committee instead of a single transitory referee, with T. B. Osborne as chairman.

Wm. Frear, chairman of the committee on food standards, reported that this committee is awaiting the securing of cooperation with the various bodies interested. Julius Hortvet, the referee on food adulteration, gave a résumé of the work done in food analysis and control, and pointed out conditions which called for more investigation. H. C. Gore, the associate referee on fruit juices, reported on some new methods in cider making. B. G. Hartmann, the associate referee on wine, reported on a study of the Hartmann and Eoff method as compared with other methods for determining total tartaric acid in wine. The use of Rochelle salts instead of tartaric acid in the method is to be considered.

L. W. Andrews read the papers on The Determination of Total Solids in Fruit Juices, and Fruit Jellies and Their Manufacture. J. G. Riley, the associate referee on beer, confined his work to a comparative study of the provisional uranyl acetate method for phosphoric acid, but found it unreliable and recommended a modification of a method given as number 2 on page 4 of Bulletin 107, revised, of the Bureau of Chemistry. The associate referee on distilled spirits, A. B. Adams, reported preliminary work in which it was found that if the aldehyde content of spirits is high, the results obtained for fusel oil with the Allen-Marquardt method are appreciably affected. The associate referee on vinegar, E. H. Goodnow, confined his energies to a general and very complete revision of the methods of vinegar analysis. The association voted to study the modification of the method for reducing sugars given in Bureau of Chemistry Circular 108, page 7, and Fincke's method for formic acid (E. S. R., 27, p. 808), and adopted these as provisional methods.

The associate referee on flavoring extracts, A. E. Paul, reported collaborative work on vanilla and peppermint extracts. A method for the direct determination of volatile oil of cloves by distillation with steam was described by J. Hortvet. W. B. Smith, the associate referee on meat and fish, reported that he had found the Price method (E. S. R., 27, p. 807) superior in point of time, manipulation, and accuracy to the Mayrhoefler-Sachsse method. Together with several other methods, it will be studied further. As a result of comparing the alcohol-vapor method, the Folin-Pennington method, and the newer Folin method for ammoniacal nitrogen, the last named was recommended as official. Some work on the determination of sugar in meats was also presented.

R. H. Kerr pointed out that the cooperative work with the glycerin saponification method and the present provisional method gave results that were slightly in favor of the former method, and it was adopted. In work with Emery's method for detecting beef fat in lard, tests were made with mixtures of lard and beef fat, lard and mutton fat, and lard and hydrogenated cotton-seed oil. It was found that the method is also of value for detecting adulterants in lard other than beef fat, and it was adopted as provisional. Beechi's test for cotton-seed oil was discarded. The method for detecting the specific gravity of high melting point fats at 75 to 100° C. is to be studied further.

J. Hortvet, the associate referee on dairy products, reported data obtained by cooperative work in studying modifications of the continuous extraction method for determining the fat in cream, homogenized cream, and ice cream. The proposed new continuous extraction method of A. E. Paul was recommended as provisional, but the association recommended further study of this and also of the modification for milk and cream products. A paper on lime as a neutral-

izer in dairy products, by H. J. Wichmann, had particular reference to the detection of added CaO, and called attention to a homogenizer now on the market with which a mixture from old butter, after treatment with lime, can be re churned.

The associate referee on cereal products, H. L. White, reported cooperative work with the method of Bryan, Straughn, and Given (*E. S. R.*, 25, p. 110) for soluble carbohydrates, methods for moisture by the use of a vacuum oven and vacuum desiccator, acidity of water extracts of flour, and Olson's method for dry gluten. The Bryan method for carbohydrates will be subject to final action in 1914 and that for acidity of watery extracts is to be studied further.

The associate referee on canned goods, E. W. Magruder, studied the percentage of easily separable liquid in canned tomatoes, and this line will be continued with tomatoes, corn, and butter beans. H. C. Lythgoe, as the associate referee on cocoa and cocoa products, reported cooperative work in the past year with milk chocolate with special reference to the amount of milk solids present, and recommended the Baier-Neumann method for casein as provisional. The associate referee on tea and coffee, J. M. Bartlett, recommended that the Fuller method for caffein in tea and coffee be studied further with regard to improving the processes of extraction and filtration, that Gorter's method be studied with reference to the purification of the caffein with sodium carbonate solution for direct weighing, and that the modified Stahl Schmidt method be given another trial with tea. F. F. Exner exhibited a sublimation apparatus and described its use for caffein, etc.

E. B. Forbes as the referee on organic and inorganic phosphorus in foods gave a résumé of cooperative investigations which involved a comparison with blood, brain, and muscle of the neutral molybdate method of Emmett and Grindley, the barium chlorid method of Siegfried and Singewald, and the magnesium mixture method of Forbes and his associates. Determinations were also made with corn germ, wheat germ, rice polish, wheat bran, alfalfa, blue grass, gluten feed, brewers' grains, timothy hay, and wheat by the acid alcohol method of Forbes et al. and the method of R. C. Collison (*E. S. R.*, 28, p. 21). The influence of phenol added to prevent cleavage of certain substances in the plant extracts on the determination of inorganic phosphorus was also studied in some cases.

The report on preservatives presented by associate referee A. F. Seeker was confined to the detection and determination of formic acid, especially by the Fincke method with complex mixtures of formic acid, and food products containing added formic acid. Special stress was laid upon studying the influence of sulphurous, benzoic, and salicylic acids. Cooperative work brought out that the Fincke method is accurate for the determination of formic acid in ordinary fruit juices and sirup, but required further study before its adoption as a general method.

The associate referee on water in foods made a study of various dehydrating agents for drying food materials in vacuum and at atmospheric pressure, using cheese, cocoa, and corn meal. Sulphuric acid, phosphorus pentoxid, calcium carbid, and metallic sodium were found to be about equal in dehydrating power, and calcium carbid and metallic sodium to be the most practicable reagents.

H. M. Loomis, the associate referee on heavy metals in foods, reported a cooperative investigation with methods for determining lead and arsenic in baking powder materials. The work on tin was the subject of a supplementary report by E. L. P. Treuthardt, and a paper on the determination of lead in phosphate and alum baking powders was presented by A. F. Seeker and H. D. Clayton. The cooperative work on the separation of nitrogenous bodies in meat and

meat products, which was reported for the associate referee on meat proteins, A. D. Emmett, continued previous work, using desiccated lean beef and a high-grade beef extract, and with determinations of total nitrogen, insoluble nitrogen, coagulable nitrogen, creatin, and creatinin. The Kjeldahl-Gunning-Arnold method for nitrogen gave as good results as the Kjeldahl or the Gunning method, and was adopted as official. The proposed method for insoluble, soluble, and heat coagulable nitrogen gave somewhat better results than the provisional method, especially as to soluble and coagulable nitrogen, and was adopted as provisional. The figures for creatin and creatinin with the Folin method showed marked differences, due to various causes. The method as modified by the referee was approved for final action in 1914. A paper on the estimation of glycerin in meat juices and extracts was presented by F. C. Cook.

L. L. Van Slyke and O. B. Winter gave a paper on a study of some conditions affecting the precipitation of casein. The report of the referee on dairy products, E. M. Bailey, consisted solely of a recommendation for the provisional adoption of the copper sulphate method for preparing milk serum for use in making observations with the immersion refractometer. The subject will be further considered.

The referee on feeds and feeding stuffs, W. J. Jones, Jr., as a result of cooperative work pointed out that in most cases higher amounts of fat are extracted from all feeding stuffs by the official method than with the proposed petroleum ether method. Three hours of extraction with petroleum ether was not sufficient to secure the total extract. Even with cotton-seed meal, petroleum ether from different sources gave different results, and the extracts must be dried at least 3 hours in order to secure constant weight. Moisture affected the results obtained by either the official or petroleum ether method. It was voted not to recognize the petroleum ether method for cotton-seed products.

W. E. Cross, the referee on sugar, reported studies in determining moisture in sugar with the Abbe refractometer and the immersion refractometer, and a comparison of the new direct polarimetric method for molasses with the modified Clerget method.

J. B. Rather, as referee, reported progress as to the testing of chemical reagents.

The final session was confined to the report of the associate referee on synthetic products, W. O. Emery, and to papers on the estimation and separation of antipyrin from various synthetic products by means of periodid, by W. O. Emery and S. Palkin, and on the analysis of medicated soft drinks, by B. H. St. John. W. F. Hand exhibited a convenient form of reflux condenser and extraction apparatus.

During the convention, Dr. H. W. Wiley, the honorary president, addressed the association. A resolution was adopted by the association for the appointment of a committee to memorialize the President of the United States and Congress to enact legislation authorizing the Secretary of Agriculture to establish definitions for better enforcement of the Food and Drugs Act. A committee on definitions, consisting of J. P. Street, J. Hortvet, and W. Frear, was also appointed to cooperate with similar committees of the American Food and Dairy Commission and the Department of Agriculture. Additional referees were authorized for a study of the Kjeldahl method, alkalis in soils, feeding stuff adulteration, and for medicinal plants and drugs.

The following officers were elected for the coming year: Honorary president, H. W. Wiley, Washington, D. C.; president, E. F. Ladd, Fargo, N. Dak.; vice president, C. H. Jones, Burlington, Vt.; secretary, C. L. Alsberg, Washington, D. C.; additional members of the executive committee, J. D. Turner, Lexington, Ky.; and W. F. Hand, Agricultural College, Miss. The 1914 meeting is to be held in Washington.

ADDITIONAL COPIES of this publication
A may be procured from the SUPERINTEND-
ENT OF DOCUMENTS, Government Printing
Office, Washington, D. C., at 15 cents per copy

Subscription price, per volume of 9 numbers, \$1



EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*
Assistant Editor: H. L. KNIGHT.

EDITORIAL DEPARTMENTS.

- Agricultural Chemistry and Agrotechny—L. W. FETZER, Ph. D., M. D.
Meteorology, Soils, and Fertilizers {W. H. BEAL.
R. W. TRULLINGER.
Agricultural Botany, Bacteriology, Vegetable Pathology {W. H. EVANS, Ph. D.
W. E. BOYD.
Field Crops {J. I. SCHULTE.
G. M. TUCKER, Ph. D.
Horticulture and Forestry—E. J. GLASSON.
Foods and Human Nutrition {C. F. LANGWORTHY, Ph. D., D. Sc.
H. L. LANG.
Zootechny, Dairying, and Dairy Farming—H. WEBSTER.
Economic Zoology and Entomology—W. A. HOOKER, D. V. M.
Veterinary Medicine {W. A. HOOKER.
L. W. FETZER.
Rural Engineering—R. W. TRULLINGER.
Rural Economics—B. B. HARE.
Agricultural Education—C. H. LANE.
Indexes—M. D. MOORE.

CONTENTS OF VOL. XXIX, NO. 9.

	Page.
Recent work in agricultural science.....	801
Notes.....	900

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Dictionary of applied chemistry, Villavecchia et al.....	801
Text-book of micro-chemistry, Emich?.....	801
Gmelin-Kraut's inorganic chemistry, edited by Friedheim and Peters	801
The methods of organic chemistry, edited by Weyl.....	801
The ether extract and the chloroform extract of soils, Fraps and Rather.....	801
Chemical studies of the lime-sulphur lead arsenate spray mixture, Ruth.....	802
Antiseptics and disinfectants, Sommerville.....	802
Suggested international test for disinfectants, Rideal.....	802
[The bacteriological standardization of disinfectants], Wright.....	803
On the carbohydrates of the shoots of <i>Sasa paniculata</i> , Miyake and Tadokoro ..	803
The preparation of levulose by biochemical methods, Fernbach and Schoen...	803
Phosphorus compounds of cotton-seed meal and wheat bran, Rather.....	804
Work in milk chemistry and dairy technology during first half of 1912, Grimmer.	805
Papers from laboratory of New York State Station, Van Slyke and Bosworth...	805
The action of rennin on casein, Bosworth.....	805
Copper sulphate serum prepared with milk, Ackermann and Valencien.....	806
The casings of the milk fat globules, Bredenberg.....	806
The reaction of milk to certain reagents, Bordas.....	806
The original acidity of milk, Bordas.....	807
A simplification in the method for determining nitrogen, Neumann.....	807
Quantitative separation of potassium from sodium, Martini.....	807
New methods for the determination of sodium and crude fiber, Forbes et al....	807

	Page.
The estimation of carbon dioxid in water, Casares and Piña.....	808
Detection of saccharose in analytical practice, Rothenfusser.....	808
A method for determining tartaric acid, Kling and Florentin.....	808
A simple method of preparing lecithin emulsions, Schippers.....	809
Determination of dry substance in root crops, Madsen-Mygdal and Christensen.....	809
Determination of the ash constituent of foods, Berg.....	809
Recommendations for the revision of the milk section in the Swiss food book..	809
The determination of saccharose in condensed milk, Nowak.....	810
Detection of small amounts of coconut fat in butter, Robin.....	810
Determination of water in cheese, Mai and Rheinberger.....	810
Determination of methyl alcohol in mixtures containing ethyl alcohol, Koenig.....	810
The estimation of rice spelts (hulls) in feeding stuffs, Grete.....	810
Methods for determining nicotin in tobacco and tobacco extracts, Tóth.....	810
Determination of nicotin in concentrated tobacco juices, Porchet and Tonduz.....	810
Laboratory handbook for the oil and fat industry, Marcusson.....	811
The fatty oil and the wax of coffee beans, Meyer and Eckert.....	811
Lumbang oil, Damer.....	811

METEOROLOGY—WATER.

Weather and water, Hoffmann.....	811
The action of the wind and its significance in agriculture, Stamm.....	811
The relation of the soil to meteorological factors, III, IV, Loske.....	811
The influence of climatic conditions on agriculture in Germany, Schnider....	811
The climate of Utah as a resource, Thiessen.....	811
Monthly Weather Review.....	812
Report of the Iowa weather and crop service for 1911, Chappel.....	812
Meteorological observations at Massachusetts Station, Ostrander and Dexter..	812
Meteorological records for 1912.....	812
Meteorology for twenty years, Knight and Fitterer.....	812
Meteorological observations of the College of Belen, Havana, 1911, Gangoiti....	813
Meteorological observations at the Ploti Experiment Station, 1912, Martynov..	813
Report of the director of the [Philippine] Weather Bureau for 1910, Algué....	813
Precipitation and run-off, Ishikari River, Japan, Okazaki.....	813
The deficient rainfall in the summer of 1913.....	813
The relation of snow to irrigation and forestry, Fergusson.....	813
Relative efficiency of talus slopes and forests in conserving snow, Church, jr...	814
Pan and raft equipment for water evaporation tests.....	814
Chemical analyses of waters.....	814
Elements of water bacteriology, Prescott and Winslow.....	814
The rationale and advantages of lime sterilization of water, Hoover.....	814
Purification of water supplies by the excess lime method, Watt.....	814
Purification of water for residences, Dunlap.....	815

SOILS—FERTILIZERS.

Glaciation and soils, Barrett.....	815
[Soil surveys in Indiana].....	815
Delic soils, Vriens.....	815
Studies on acid soils of Porto Rico, Loew.....	815
Soil acidity, Buckman.....	816
Occurrence of acidity in highland soils, Meggitt and Birt.....	816
The permeability of the soils of Egypt, Audebeau.....	816
The importance of colloid substances in the soil, Rohland.....	817
Bacterial activity in soil as a function of physical soil properties, Rahn.....	817
The origin of certain organic soil constituents, Sullivan.....	817
Characteristics of cellulose-destroying bacteria, McBeth et al.....	817
Experiments on denitrification, Chirikov and Shmuk.....	817
Relations of plants to formation of nitrates in soils, Lyon and Bizzell.....	818
Nitrogen fixation by organisms from Utah soils, Peterson and Mohr.....	819
Ammonifying efficiency and algal content of certain Colorado soils, Sackett...	819
Abnormal fixation of atmospheric nitrogen, Gimmingham.....	819
Soil inoculation under soil conditions of lime deficiency, Beckwith.....	820
The bread supply, Hopkins.....	820
Bread from stones, Hopkins.....	820
Soil experiments on Caldwell field, Lyon.....	820
Farm manures, Thorne.....	820

Poultry manures, their treatment and use, Haskins and Walker.....	820
The action of green manures, Mielck.....	820
Fertilizers and fertilizing, Hoffmann.....	821
Agricultural fertilizers and fish life, Butterfield.....	821
Results of long-time experiments with fertilizers, Clausen.....	821
Soil and fertility, Wenz.....	821
The relation of fertilizer consumption to crop production, Kilgore.....	821
The future of the fertilizer industry in the United States, Cameron.....	821
The commercial value of nitrogen, Messier.....	821
Utilization of atmospheric nitrogen by natural and artificial means, Marshall..	821
The industrial synthesis of nitric acid and ammonia, Matignon.....	822
Formation of aluminum nitrid from alumina, carbon, and nitrogen, Fraenkel..	822
The fixation of air nitrogen by means of boron compounds, Stähler and Elbert..	822
Fixation of nitrogen by barium oxid and charcoal, Ewan and Napier.....	822
Tectonics of the potash deposits of Kalusz, eastern Galicia, Kossmat.....	822
Potash from silicates, Friedensburg.....	822
White rock phos. hates of Decatur County, Tennessee, Maynard.....	822
Discovery and opening of a new phosphate field in the United States, Jones..	822
The composition of phosphatic slag, Rousseaux and Joret.....	822
The valuation of basic slag, Edwardes-Ker.....	823
The action of lime in Thomas slag.....	823
Calcium fluosilicate as a new lime fertilizer or amendment, Alvisi.....	823
Injurious effect of heavy applications of lime on upland moor soils, Densch...	823
Causes and character of injury of large amounts of lime on peat, Ritter.....	823
Chemical composition of garbage and street sweepings of Montevideo, Schröder..	823
Analyses of registered fertilizers, Willard, Swanson, and Wiley.....	823
Analyses of commercial fertilizers, Kastle and Curtis.....	823
Analyses of commercial fertilizers, Hartwell et al.....	823

AGRICULTURAL BOTANY.

Methods for bacteriological examination of soils, Brown.....	824
A new method for the bacteriological examinations of soils, Brown.....	824
Nitrogen collecting bacteria, fallow, and exhaustive culture, Pfeiffer.....	824
Can fungi living in agricultural soil assimilate free nitrogen? Goddard.....	824
Sporulation in <i>Aspergillus niger</i> and <i>A. fumigatus</i> , Sauton.....	825
The water requirements of plants, Briggs and Shantz.....	825
Summer evaporation intensity as factor in distribution of vegetation, Nichols..	826
Calcareous chlorosis of green plants: Rôle of root excretions, Mazé et al.....	826
The formation of anthocyanin in mitochondria, Guilliermond.....	827
Glucosamin hydrochlorid as a source of nitrogen for corn and beans, Hamlin..	827
Variations of carbohydrates in the development of leaves, Durand.....	827
The effect of formaldehyde on living plants, Baker.....	827
The power of growth in plants, Stone.....	827
On the germination of the seeds of some dicotyledons, Adams.....	828
Germination of seeds after chemical treatment and exposure to light, Simon..	828
The reactions of the leaf hairs of <i>Salvinia natans</i> , Andrews and Ellis.....	828
Osmotic pressure in plants, I, II, Dixon and Atkins.....	828
The physiology of the pollen of <i>Trifolium pratense</i> , Martin.....	829
Number of ovules formed and capacity of ovary for maturing its ovules, Harris..	829
Bud variations in <i>Solanum</i> , Heckel and Verne.....	829

FIELD CROPS.

[Fertilizer experiments with field crops], DeJong.....	829
New publications on the subject of plant breeding.....	830
Report of the Minnesota Field Crop Breeders' Association, compiled by Bull..	830
Annual report upon the agricultural department, Johnson.....	830
Annual report of the department of agriculture, Bombay Presidency, Smart...	830
Annual report of Cuttack Agricultural Station, 1911-12, Sherrard.....	830
Report of the agricultural department, Assam, McSwiney.....	830
Bermuda [grass], Churchill.....	830
The Mendelian chemical characters in maize, Pearl and Bartlett.....	830
Corn culture, Dearing.....	830
Field trials with varieties of mangels, Stokes.....	830
Field trials on top-dressings for mangels, 1912, Wakerley and Stokes.....	830

	Page.
Oats: Culture, varieties, and fertilization, Duggar and Cauthen.....	831
Three and four year oat experiments, Ohlmer.....	831
An anatomical investigation of some oat families, Jakushkine and Wawilow...	831
Inheritance of certain characters in beets and turnips: I, Beets, Kajanus....	832
Sugar content of root and characters of descendants, Andrlík and Urban.....	832
Appropriation of nitrogen by descendants of a beet, Andrlík and Urban.....	832
Variability in descendants in first generation, Andrlík and Urban.....	833
The cultivation of cane and the sugar industry, Sobrinho.....	833
Sugar cane and sirup making, Spencer.....	833
Results of field trials on the manuring of swedes, Stokes.....	833
The value of sweet clover, Sinn.....	833
Research into the variety classification of <i>Triticum vulgare</i> , Moebius.....	833
Investigations concerning chemical composition of wheat, 1906-1912, Thatcher.	833
Tri-local soil exchange experiments with wheat, Le Clerc and Yoder.....	835
Wheat culture on moor lands, Freckmann and Sobotta.....	835
Preparing land for wheat, Call.....	836
New method of detecting vitality of seeds, Tashiro.....	836
The examination of the germinative ability of various weed seeds, Gumbel....	836
The occurrence of viable weed seeds in the soil, Snell.....	836

HORTICULTURE.

Statistics of vineyards, orchards and gardens, and root crops, 1912-13, Sholl...	837
The rational manuring of truck crops, Dumont.....	837
Determination of plant nutrients removed from soil by peas and beans, Kochs.	837
[Notes on the occurrence of pathenogenesis in various plants], Höstermann...	837
Fruit growing, its history and practice, Schulz.....	837
Fruit farming: Practical and scientific, Hooper et al.....	837
Orchard nursery work: Budding and grafting, Allen.....	838
Inspection service, control of insects and diseases, Mumford and Höseman....	838
New or noteworthy fruits, Hedrick.....	838
Some good fruits recently grown, Hall.....	838
New varieties of the avocado for California, Part I, Ryerson.....	838
A graft hybrid between the peach and almond, Daniel and Delphon.....	838
Modern methods of packing apples and pears, McNeill.....	838
[Influence of fertilizers on the composition of currant juice], Kochs.....	838
Sulphate of manganese as a fertilizer for grapes, Sannino and Tosatti.....	838
Influence of spray mixtures on germination of grape pollen, Garino-Canina....	839
The effect of humidity and cold upon grapes, Zacharewicz.....	839
Varieties of plantains and bananas cultivated in Seychelles, Dupont.....	839
The bureau of agriculture banana collection, Barrett.....	839
New citrus fruits, Swingle.....	839
<i>Citrus ichangensis</i> , a promising, hardy, new species, Swingle.....	839
Coconuts, the consols of the East, Smith and Pape.....	840
Report of the work at the experiment station, Dorner.....	840
Hardy perennials and herbaceous borders, Wright.....	840
The garden and its plantings, Lange.....	840
Suburban gardens, Tabor.....	840
Every day in my garden, Verplanck.....	840

FORESTRY.

Influence of the origin of seed upon the character of forest growth, Engler.....	841
Influence of too deep planting on the longevity and yield of pine, Geist.....	842
The influence of forests upon climate, Ward.....	842
The correction of avalanches in Grisons, Mougin.....	842
Some aspects of European forestry, Recknagel.....	842
Trees and shrubs, edited by Sargent.....	842
Trees and shrubs of New Mexico, Wooton.....	842
Cedar woods, Dallimore.....	842
The latex system of rubber trees, Meunier.....	842
Scientific studies of <i>Hevea brasiliensis</i> , De Jong.....	843
Hevea: Yields of some Henaratgoda trees, Lyne.....	843
Tapping Ceara (<i>Manihot glaziovii</i>), Arens.....	843
Wood-using industries of Ontario, Lewis and Boyce.....	843
Forest products of Canada, 1912.—Poles and cross-ties, Lewis and Boyce.....	843

DISEASES OF PLANTS.

	Page.
Factors affecting susceptibility to disease in plants, I, Spinks.....	844
The sterilization of seed, Massee.....	844
Biological and morphological study of a new <i>Aspergillus</i> , Sartory and Sygow.....	844
Study of a new <i>Penicillium</i> , Sartory.....	844
A bacteriosis of <i>Ixia maculata</i> and of <i>Gladiolus colvilli</i> , Severini.....	844
The enzymatic activity of two bacteria pathogenic to plants, Severini.....	845
Annual report for 1912 of the botanist, Biffen.....	845
Report of the Hohenheim Institute for Plant Protection, 1912, Kirchner.....	845
Field experiments with flag smut, Peacock.....	845
On pure cultures of <i>Phytophthora infestans</i> , Pethybridge and Murphy.....	846
Use of the green muscadine in the control of some sugar cane pests, Rorer.....	846
The stem rot or Hawaiian "iliiau" disease of sugar cane, Edgerton.....	846
Club root in South Africa, Evans.....	846
Celery blight, or rust, and its prevention, Salmon.....	846
Lettuce drop, Burger.....	846
A disease of tomatoes, Brooks and Price.....	847
Tomato diseases, Rolfs.....	847
Silver leaf disease, II, Brooks.....	847
The Jonathan spot rot, Cook and Martin.....	847
Jonathan fruit spot, Norton.....	848
Studies on the water core of apple, O'Gara.....	848
Fire blight of pear and apple, Hall.....	848
The brown rot canker of the peach, Jehle.....	848
A leaf disease of papaya, Maublanc.....	848
Abnormal roots of figs, Wolf.....	849
Combating anthracnose, Zacharewicz.....	849
Treatments of gray rot of grapes, Thouret and Vidal.....	849
Studies on grape diseases in 1912; attacks of black rot, Capus.....	849
Studies on grape diseases in 1912 in Gironde, Capus.....	849
Studies on grape diseases in 1912 in Aude, Capus.....	849
Studies on grape diseases, 1912; treatment for downy mildew, Capus.....	849
Studies on grape diseases, 1912; receptivity to mildew, Capus.....	849
An outbreak of mildew, Bailly.....	850
Precise data regarding an attack of mildew, Labergerie.....	850
Treatments for Oidium of grapevines, Thouret and Vidal.....	850
Wetting power of fungicidal mixtures, Vermoral and Dantony.....	850
A spreading and adherent form of Bordeaux mixture, Chauzit.....	850
Prevention and treatment of American gooseberry mildew, Hiltner and Korit.....	850
The Surinam witches' broom disease of cacao, Rorer.....	851
Coffee disease in East Africa.....	851
Resistance of a variety of <i>Helianthus annuus</i> to <i>Orobanch cumana</i> , Satsyperov.....	851
Notes on some diseases of trees in our National Forests, III, Hedgcock.....	851
Notes on diseases of trees in the southern Appalachians, I, Graves.....	851
Some observations on <i>Polyporus berkeleyi</i> , Weir.....	852
Germination studies with spores of <i>Merulius</i> , Wehmer.....	852

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Officials and organizations for protection of birds and game, 1913, Palmer.....	852
The rat, a sanitary menace and an economic burden, Creel.....	852
The amended insecticide law, Woodworth.....	852
Analyses of insecticides for users, Gray.....	852
Powdered arsenate of lead, Morrill.....	852
[Insect pests and their control in St. Lucia].....	852
Injurious insects in the Government of Moscow during 1912.....	852
[Insect pests in Java].....	852
[Insects in Sumatra], DeBussy.....	853
Garden and truck-crop insect pests, Sanborn.....	853
Insect enemies of lentils, Noel.....	853
The enemies of the orach (<i>Atriplex hortensis</i>), Noel.....	853
Two enemies of the coconut palm in the Malgasy region, Vuillet.....	853
Text-book of forest entomology, Nüsslin.....	853
Insect enemies of camphor trees, Morstatt.....	853
Insect enemies of the osier, Feytaud.....	853
Contribution to the study of the Thysanoptera of France, Vuillet.....	853

	Page.
<i>Nysius senecionis</i> and its damage to the vine, Semichon and Picard.....	854
The chinch bug and its control, Haseman.....	854
A parasite of the chinch bug egg, McColloch.....	854
The Psylla disease of indigo in Behar, Maxwell-Lefroy.....	854
Plant lice or green fly, Davidson.....	854
Production by grape phylloxera of inverted galls on <i>Vitis berlandieri</i> , Picard...	854
The sugar cane mealy bug in Costa Rica.....	854
The control of the Japanese fruit scale (<i>Diaspis pentagona</i>) in Italy, Berlese...	854
The Florida fern caterpillar (<i>Eriopus floridensis</i>), Chittenden.....	854
An unusual parsnip pest, Harrison.....	855
The silkworm, Fauchère.....	855
A bacillary septicemia of caterpillars of <i>Arctia caja</i> , Picard and Blanc.....	855
The rose slug caterpillar (<i>Euclea indetermina</i>), Chittenden.....	855
New parasites of the cacao moth and parasites in general, Roepke.....	855
The potato-tuber moth, Chittenden.....	855
[The potato-tuber moth in Victoria], Seymour.....	855
Destruction of imported flour moth (<i>Ephestia kühniella</i>), Durrant and Beveridge.	856
<i>Leucoptera coffeella</i> , an insect enemy of coffee in Sao Paulo, Thering.....	856
The species of Anopheles that transmit human malaria, Knab.....	856
The breeding places of Phlebotomus, Howlett.....	856
The ghost of verruga, Townsend.....	856
Further observations on the parasites of Simulium larvæ, Strickland.....	856
Warble flies.....	856
The sheep botfly or head maggot (<i>Æstrus ovis</i>), Serres.....	856
The serpentine leaf miner, Webster and Parks.....	857
A serious pest of <i>Coffea arabica</i> in Belgian Kongo, Mayné.....	857
Root borers and other grubs in West Indian soils.....	858
Beetles affecting the coconut palm, Ulrich.....	858
An insect causing serious injury to vineyards.....	858
<i>Phytalus smithi</i> and other beetles injurious to cane, D'Emmerez de Charmoy...	858
Injury caused by <i>Criocephalus rusticus</i> to building timber, Houlbert.....	858
Corn injury by wireworms (<i>Agriotes lineatus</i>) in Bessarabia, Koslovskii.....	858
<i>Xyleborus (Anisandrus) dispar</i> and its food fungus, Schneider-Orelli.....	858
Tables for identification of the bark beetles (Scolytidæ), Reitter.....	859
Investigations pertaining to Texas bee keeping.....	859
Mendelian methods applied to apiculture, Sladen.....	860
Biological and embryological studies on Formicidæ, Tanquary.....	860
An unrecorded apple sawfly in Britain (<i>Lygæonematus mæstus</i>), Theobald.....	861
Spider's web and malaria, Knab.....	861
The biology of some North American ticks, Bishopp and Wood.....	861

FOODS—HUMAN NUTRITION.

Mineral and organic analyses of foods, Forbes, Beegle, and Mensching.....	861
Interim report on the supply and distribution of meat, Bavin et al.....	862
Composition and judgment of sausages, Avé-Lallemant.....	863
The presence of some organic bases in dried herring roe, Yoshimura.....	863
Cheese as a food and its judgment from standpoint of food chemist, Reich.....	863
The influence of germination on the milling qualities of wheat, Swanson.....	863
Relation of the composition of flour to baking quality, Bailey.....	864
Studies on the fermentation of bread, Vandevelde et al.....	864
Digestion experiments with army bread, Lebbin.....	864
Use of corn, Kafir, and cowpeas in the home, Langworthy and Hunt.....	864
A chemical investigation of Asiatic rice, Cushman and Fuller.....	865
Rice as a food.....	865
Effect of commercial rice coating on neuritis production, Wellman and Bass...	865
The soy bean, Granato.....	865
Concerning the nutritive value of edible fungi, Von Hellens.....	865
The judgment of fruit products Härtel.....	865
[Food analyses and other pure food and drug topics], Ladd and Johnson.....	865
[Food inspection and other topics], Wallis and Mason.....	866
Preliminary report of dairy and food commissioner for 1912, Foust.....	867
Analyses of confectioners' glucose, Gudeman.....	867
Adulterating salt with potassium salt rich in sodium chlorid, Goy.....	867
A new method of canning, Kochs.....	867
Factors in the cost of living, Blackmar.....	867

	Page.
[Marketing and the cost of living].....	867
Food waste and its remedy.....	868
The nutritive value of gelatin, Maignon.....	868
The function of fats and carbohydrates in nutrition, Maignon.....	868
Carbohydrate metabolism in its relation to thyroid gland, Cramer and Krause.....	868
The influence of protracted and intermittent fasting upon growth, Morgulis....	869
A respiration apparatus for use with small animals, Fridericia.....	869

ANIMAL PRODUCTION.

The making and feeding of silage, Woodward et al	869
A notorious Indian fodder grass, Hole.....	869
Peanut-oil cake, Le Conte et al.....	869
On the pressed cake of Perilla seed, Bredemann.....	869
[Commercial stock feeds], McRae.....	869
Phosphoric acid, calcium phosphate, and other phosphorus compounds, Girard.....	869
On the cost of meat production, Lan and Mendoza.....	870
[Beef cattle in Argentina], Cotrim.....	870
Feeding experiments on roughages and concentrated feeds, Schneidewind.....	870
Advantages from use of pure-bred ram, Hackedorn.....	870
Sheep for Washington farms, Ashby.....	870
Lamb feeding and sheep husbandry in Idaho, Carlyle and Iddings.....	870
Feeding experiments with lambs, 1908-1911, Morton.....	871
Breeding lambs for fur, Smith.....	872
Docking and castrating lambs, Hackedorn.....	872
Dalgety's annual wool review for Australasia.....	872
Productive swine husbandry, Day.....	872
Ration experiments with swine, 1908-1911, Morton.....	872
Pig-feeding experiment, Hutchison.....	873
Feeding work horses, McCampbell.....	873
[Report of the] Kansas Live Stock Registry Board.....	873
How the English are breeding polo ponies to type, Dale.....	874
A wild pony fair.....	874
The primary gonocytes during the period of sexual indifference, Firket.....	874
Jumping conformation, St. Gatien.....	874
Breeding for heavy egg production, Pearl.....	874
Studies in egg marketing, Thompson.....	875
Preserving eggs, Olson.....	875

DAIRY FARMING—DAIRYING.

The station dairy herd and the cost of milk production, Lindsey and Smith....	876
Dairying in Oklahoma, Potts and Bray.....	876
[Dairy Experiments at Hameln, 1912], Vieth.....	876
Percentage of milk fat and quantity of milk produced by Ayrshire cows, Vigor..	876
Effect of neutralization with chalk on sour-milk bacteria, Makrinoff.....	877
Milk hygiene, Ernst.....	877
Effect of certain dairy operations on germ content of milk, Harding et al.....	878
Some unessential dairy refinements, Hall.....	878
Cleanliness and cold as applied to the dairy, Nystrom.....	878
Medical milk commissions and certified milk, Kelley.....	879
Directions for testing cream, Rinkle.....	879
Cause of variation in percentage of fat of cream from farm separators, Jones...	879
The permit system of cream buying, Hine and Droge	879
Homogenizer experiments, Bishop and Murphy.....	879
Milk powders and condensed milk [analyses of], McGill.....	880
The new warm-chamber method of making "Grana" cheese, Oliva.....	880

VETERINARY MEDICINE.

The diseases of animals, Mayo.....	880
Report on veterinary sanitary service of Paris and the Seine, 1912, Martel.....	880
Pathological dangers to domestic animals from contaminated streams, Parker..	880
Rotation of blood plasma and serum from animals, Abderhalden and Weil....	881
Blood and exudate leucocytes with reference to phagocytic activity, Amatsu....	881
A precipitin for rice protein, Kanahara.....	881

	Page.
Detection of paratyphoid infections with aid of precipitin test, Reinhardt....	881
Weichardt's epiphanin reaction, Korff-Peterson and Brinkmann.....	881
In regard to the epiphanin reaction, Von Angerer.....	882
Is pressor effect of pituitrin due to adrenal stimulation? Hoskins and McPeck..	882
The selective bactericidal action of methylene blue, Churchman.....	882
Precipitin diagnosis of symptomatic anthrax, Hecht.....	882
The growth of the swine erysipelas bacillus, Wyschelessky.....	882
Some investigations of <i>Babesia bigemina</i> , Vrijburg.....	882
A remarkable bacterial group in man and animal, Gildemeister and Baerthlein..	882
The detection of the <i>Bacillus völdagsen</i> in man, Neumark.....	883
The effect of quinin on rabies in dogs, Moon.....	883
Spirochetosis, Nuttall.....	883
The specificity of the streptococci of strangles, Bemelmans.....	883
Some cases of surra treated in the autumn of 1911, Holmes.....	883
Phenol in treatment of tetanus, Kimball.....	883
Tuberculosis, Salmon.....	884
The way Koch's bacillus enters the body, Vallée.....	884
Curative and protective vaccination against human tuberculosis, Friedmann..	884
Tuberculosis in man and bovines in Sardinia, Jatta et al.....	884
Bovine tuberculosis investigations, Haring.....	884
The history of tuberculosis in the college herd, Havner.....	885
The sanitary police and the prophylaxis against bovine tuberculosis, Desliens..	886
About the treatment of tuberculosis in bovines with Tuberculosan, Fleischhauer	886
Histological studies of actinomycosis of the bovine, Joest and Zumpé.....	886
Anaplasmosis in cattle in South America, Lignéres.....	886
Cattle dipping at short intervals, Laws.....	886
The tick-killing properties of sodium arsenate, Laws.....	886
How ticks are killed when cattle are dipped, Laws.....	886
<i>Cysticercus ovis</i> , the cause of tapeworm cysts in mutton, Ransom.....	886
Pathogenesis and pathological histology of intestinal anthrax, Nieberle.....	888
Detecting erysipelas in hogs with Ascoli's reaction, Seibold.....	888
Hog cholera and preventive serum, Burson and Rothe.....	888
The antihog-cholera serum laboratory, Hunt.....	888
Hog cholera and its prevention, Marsteller.....	889
A new cylicostome worm from the horse in London, Leiper.....	889
Medical treatment of coccidiosis in chickens, Meyer and Crocker.....	889

RURAL ENGINEERING.

Message of the governor of Porto Rico [regarding irrigation], Colton.....	889
Irrigation and flood protection, Papago Reservation, Olberg and Schanck.....	889
Swampy lands, Dumont.....	890
Public road systems of foreign countries and of the several States.....	890
Strength of materials, Murdock.....	890
Experiments on the action of various substances on cement mortars, Meade....	890
Flow of water in pipes, Durand.....	891
Windmills in India, Baker.....	891
The principles of fuel-oil engines, Hirshfield.....	891
Oil for internal-combustion engines.....	892
Pressures in gasoline engines, Field.....	892
The motor and the dynamo, Arnold.....	892
Practical power of the brick industry and for threshing, Charbonnier.....	892
The care and use of agricultural machinery, Holldack.....	892
Facts and figures on the oil tractor for the farm, Barnet.....	893
The theory of centrifugal pumps, Daugherty.....	893
Test of a two-stage turbine pump, Potter and Carlson.....	893
Test of a row and broadcast seed drill, Gieseler.....	893
Steam pipes in dairies.....	893
Electrical engineer's pocketbook, Foster.....	893

RURAL ECONOMICS.

Rural economics and rural sociology, Phelan.....	894
A suggested solution of the rural problem, Plunkett.....	894
The rural problem, or why farmers should organize and stay organized, Green..	894
Marketing and farm credits.....	894
Application of agricultural credit systems to American problems, Dillon.....	894

	Page.
"Cheap money" commission reports.....	895
The international postal savings banks and the interests of agriculture.....	895
Agricultural cooperation in Argentina, Girola.....	895
Land reform, peasant proprietary, and rural education, Collings.....	895
[Collective or cooperative renting], Rambaud.....	895
Danish small holdings, Lister.....	895
Registering title to land, Dumas.....	895
Employment of white labor in the sugar plantations of Queensland, Gregory...	896
Importance of agriculture, commerce, and industry in various countries.....	896
The agricultural outlook.....	896
The future of tropical America.....	896
Victorian yearbook, 1911-12, Laughton.....	896
German agriculture under Emperor William II, edited by Dade.....	896
Agriculture and stock raising [in Norway], 1906-1910.....	897
Agricultural statistics, Joubert.....	897
Agricultural law, 1913.....	897

AGRICULTURAL EDUCATION.

Progress in agricultural education, 1912, Lane.....	897
Statistics of land-grant colleges and experiment stations, 1912, Hare.....	897
Report of agriculture in the high schools of Michigan, French.....	897
Agricultural education and research in England and Wales.....	897
Agricultural education in Scandinavia, Ainsworth-Davis.....	897
Agricultural and horticultural officials, institutions, and associations.....	897
Window gardening for schools, Cardozo.....	898
The Home Gardening Association.....	898
Selecting and staging vegetables for exhibition.....	898
Woman's place in rural economy, De Vuyst, translated by Hunter.....	898
Home economics at the New York State College of Agriculture, Van Rensselaer.	898
Lessons in cooking for the sick and convalescent.....	898
Suggestions for the dining room, Miskimen and Matthews.....	898
Clark University—catalogue of school hygiene, Burnham and Fitzsimmons....	898
Farmers' institute and extension work in the United States, 1912, Hamilton...	898
The farm adviser in Missouri, Mumford and Doane.....	899
The county farm adviser plan, Doane.....	899
[Suggestions for extension work in rural schools], Morton and Bullock.....	899

MISCELLANEOUS.

Annual Report of the Office of Experiment Stations, 1912.....	899
Annual Report of California Station, 1913.....	899
Thirty-first Annual Report of New York State Station, 1912.....	899
Laws applicable to U. S. Department of Agriculture, compiled by Gates.....	899
The county experiment farm law.....	899

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

Stations in the United States.

	Page.
Alabama College Station:	
Bul. 173, Sept., 1913.....	831
California Station:	
Circ. 103, June, 1913.....	814
Circ. 104, Aug., 1913.....	852
Circ. 105, Aug., 1913.....	852
An. Rpt. 1913.....	884, 888, 899
Colorado Station:	
Bul. 187, June, 1913.....	871
Bul. 188, June, 1913.....	872
Florida Station:	
Bul. 116, Oct., 1913.....	846
Bul. 117, Nov., 1913.....	847
Bul. 118, Nov., 1913.....	833
Idaho Station:	
Bul. 77, Sept., 1913.....	870
Illinois Station:	
Circ. 163, Sept., 1913.....	820
Circ. 168, 2. ed. rev., Oct., 1912.	820
Iowa Station:	
Research Bul. 11, June, 1913 .	824
Research Bul. 12, June, 1913 .	802
Kansas Station:	
Bul. 183, Oct. 1, 1912.....	873
Bul. 184, July, 1913.....	879
Bul. 185, July, 1913.....	836
Bul. 186, Dec., 1912.....	873
Bul. 187, Jan., 1913.....	823
Kentucky Station:	
Bul. 168, Dec. 31, 1912.....	823
Massachusetts Station:	
Bul. 145, Sept., 1913.....	876
Circ. 35, Mar., 1913.....	820
Met. Buls. 297-298, Sept.-Oct., 1913	812
Minnesota Station:	
Bul. 132, Apr., 1913.....	875
Missouri Station:	
Circ. 59 (rev.), Mar., 1913.....	899
Circ. 60, Mar., 1913.....	899
Circ. 61, Apr., 1913.....	872
Circ. 62, May, 1913.....	854
Circ. 63, Mar., 1913.....	838
Circ. 64, July, 1913.....	879
Circ. 65, July, 1913.....	870
New Mexico Station:	
Bul. 87, June, 1913.....	842
New York Cornell Station:	
Memoir 1, July, 1913.....	818
New York State Station:	
Bul. 364, July, 1913.....	838
Bul. 365, Aug., 1913.....	878
Tech. Bul. 31, Sept., 1913.....	805
Thirty-first An. Rpt. 1912..	812, 899
North Dakota Station:	
Spec. Bul., vol. 2, No. 17, July, 1913.....	803, 865
Spec. Bul., vol. 2, No. 18, Aug., 1913.....	803, 865

Stations in the United States.—Contd.

	Page.
North Dakota Stations—Contd.	
Spec. Bul., vol. 2, No. 19, Sept., 1913.....	803, 811, 865
Ohio Station:	
Bul. 255, Jan., 1913.....	807, 861
Circ. 139, June 15, 1913.....	899
Oklahoma Station:	
Bul. 99, June, 1913.....	875
Bul. 100, Oct., 1912.....	853
Circ. 16, Dec., 1912.....	830
Pennsylvania Station:	
Bul. 123, Aug., 1913.....	885
Porto Rico Station:	
Bul. 13, Oct. 20, 1913.....	815
Rhode Island Station:	
Insp. Bul., Sept., 1913.....	823
Texas Station:	
Bul. 155, Jan., 1913.....	801
Bul. 156, Mar., 1913.....	804
Bul. 157, Apr., 1913.....	889
Bul. 158, June, 1913.....	859
Washington Station:	
Bul. 111, Sept., 1913.....	833
Popular Bul. 53, May 19, 1913.	879
Popular Bul. 54, Aug. 12, 1913.	875
Popular Bul. 55, Aug. 24, 1913.	878
Popular Bul. 56, Sept. 11, 1913	848
Popular Bul. 57, Sept. 13, 1913	870
Wyoming Station:	
Bul. 100, Sept., 1913.....	812

U. S. Department of Agriculture.

Jour. Agr. Research, vol. 1, No. 1, Oct., 1913.....	839, 857, 886
Mo. Weather Rev., vol. 41, Nos. 7-8, July-Aug., 1913.....	812
Bul. 1.....	878
Farmers' Bul. 556.....	869
Farmers' Bul. 557.....	855
Farmers' Bul. 558.....	896
Farmers' Bul. 559.....	864
Farmers' Bul. 560.....	896
Bureau of Biological Survey:	
Circ. 94.....	852
Bureau of Entomology:	
Bul. 124.....	855
Bul. 125.....	854
Bureau of Plant Industry:	
Bul. 284.....	825
Bul. 285.....	825
Office of Experiment Stations:	
An. Rpt. 1912.....	897, 898, 899
Office of the Solicitor:	
Laws Applicable to U. S. Dept. Agr. (rev.), 1912.....	899
Laws Applicable to U. S. Dept. Agr., 1912, First Sup.....	899

EXPERIMENT STATION RECORD.

VOL. XXIX.

ABSTRACT NUMBER.

No. 9.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Dictionary of applied chemistry, V. VILLAVECCHIA ET AL. (*Dizionario di Merceologia e di Chimica Applicata*. Milan, 1911-1913, 3. ed., rev. and enl., vols. 1, pp. XIV+1558; 2, pp. 1360).—This dictionary, which is in the Italian language, deals with terms and definitions of foods, chemicals, and pharmaceutical products. The English, German, and French equivalents are given for each substance or product discussed.

Text-book of micro-chemistry, F. EMICH (*Lehrbuch der Mikrochemie*. Wiesbaden, 1911, pp. XIII+212, figs. 30).—This book is divided into a general part which deals with general methods used in micro-chemistry, and a special part which deals with the inorganic cations and anions, and organic compounds (alkaloids, glucosids, and proteins).

Gmelin-Kraut's handbook of inorganic chemistry, edited by C. FRIEDHEIM and F. PETERS (*Gmelin-Kraut's Handbuch der anorganischen Chemie*. Heidelberg, 7, ed., rev. and enl., vol. 1, pts. 1, 1907, pp. XXXIV+888, figs. 10; 2, 1909, pp. XXX+441; 3, 1911, pp. XXXIX+907; vol. 2, pts. 1, 1906, pp. XXVII+512, figs. 46; 2, 1909, pp. XXXVI+726, figs. 7; vol. 3, pts. 1, 1912, pp. XCI+1568; 2, 1908, pp. LIV+1135, fig. 1; vol. 4, pt. 1, 1911, pp. LXX+1056).—This is the seventh edition of this well-known handbook, which has been entirely revised and enlarged.

The methods of organic chemistry, edited by T. WEYL (*Die Methoden der Organischen Chemie*. Leipsic, 1909-1911, vols. 1, pp. XIX+360, figs. 257; 2, pts. 1, pp. XXI+703, figs. 14; 2, pp. XXI+705-1462, figs. 33).—This large handbook, which is meant for the laboratory, deals with the methods used in pure organic chemical work. Among the chapters in the 2 volumes are organic elementary analysis (qualitative and quantitative); simplified methods of elementary analysis; methods for determining molecular weights; crystallization; extraction; preparation of gases; sublimation; polarization; electrical conductivity methods; oxidation and reduction; the decomposition of optically active substances into their active components; polymerization and depolymerization; catalysis; preparation and the use of the more important enzymes; condensation; the aldehyde and ketone groups; ozonids; carboxyl groups; nitroso groups; diazo and azo groups; amino acids; polypeptids; metal-organic compounds; amino and imino groups; calorimetry of organic compounds; and drying of organic fluids.

The ether extract and the chloroform extract of soils, G. S. FRAPS and J. B. RATHEE (*Texas Sta. Bul.* 155, pp. 3-6).—In this work 28 soils were examined

and found to contain an average of 0.0203 per cent of ether extract. By subsequently extracting 24 of the same soils with chloroform, 0.0174 per cent of extract was obtained. The ether extract was found to be composed of 50 per cent unsaponifiable and 40 per cent saponified material, with a loss of 10 per cent, and probably contains fatty acids and wax alcohols. This is nearly the same as the average composition of the ether extracts of plants. "The chloroform extract consists of 36 per cent unsaponifiable, 43 per cent saponified, 3 per cent insoluble, and 18 per cent loss."

Chemical studies of the lime-sulphur lead arsenate spray mixture, W. E. RUTH (*Iowa Sta. Research Bul. 12, pp. 409-419*).—This is a study of the reactions which take place when lime-sulphur solution and lead arsenate are mixed. It was found when bringing these 2 fungicides together that an increase in the thiosulphate content of the solution and the residue and the sulphite content of the solution takes place. The author concludes that if the fungicidal value of lime-sulphur wash is dependent upon its content of thiosulphate and sulphites, as claimed by Haywood (*E. S. R., 18, p. 853*), the real function of adding lead arsenate lies in the fact that it leads to the formation of these substances.

The close analogy of color formation undergone by precipitating lead thioarsenate and that of mixing lead arsenate and lime-sulphur led the author to look for arsenic sulphid, but none was found. The evidence, however, seems to point to the formation of a compound insoluble in lime-sulphur containing arsenic and sulphur and which in all probability is lead thioarsenate. Further changes noted were a decrease in both calcium and sulphur in the solution and the formation of lead sulphid.

The Harris method (*E. S. R., 25, p. 414*) for determining thiosulphate gave good results. For previous work in this connection see other notes (*E. S. R., 23, p. 701*).

Antiseptics and disinfectants, D. SOMMERVILLE (*Jour. Roy. Soc. Arts, 61 (1913), Nos. 3172, pp. 927-937; 3173, pp. 945-952*).—A lengthy and critical exposition of the chemical, physical, and biological principles underlying the action of antiseptics and disinfectants.

Suggested international test for disinfectants, S. RIDEAL (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 26 (1912), Sects. VIa-XIb, App., pp. 261, 262*).—The Hygienic Laboratory phenol coefficient (H. L. P. C.) method of Anderson and McClintic, which is based on a modification of the Rideal-Walker method, is regarded as too expensive for everyday control work, and a method is proposed in its stead in which are incorporated the more important features of the Rideal-Walker test, as follows:

"(1) Organism—*Bacillus typhosus*; (2) test culture—subcultured and filtered (as recommended by Anderson and McClintic)^a; (3) temperature of disinfection—20° C. (as recommended by Anderson and McClintic); (4) dose of test culture to disinfectant 0.1 cc. per 5 cc. measured from a graduated pipette (as recommended by Anderson and McClintic); (5) calculation of results—from an empirical time (yet to be fixed) with the 15 [minutes] duration of the test (as recommended by Chick and Martin).

"This test is practically the same as the H. L. C. P. method except that such extensive test charts would not be required. Calculating on the basis of 7½ minutes as the fixed time for sterility, from the H. L. P. C. test charts of over 50 different disinfectant preparations examined by McClintic it was found that the results agreed very closely with the reported H. L. P. C.

^a Pub. Health and Mar. Hosp. Serv. U. S., Hyg. Lab. Bul. 82, 1912, pp. 74.

values, the greatest divergence being only 0.48 in the case of a coefficient of over 12."

[The bacteriological standardization of disinfectants], J. H. WRIGHT (*North Dakota Sta. Spec. Bul.*, 2 (1913), Nos. 17, pp. 289-292; 18, pp. 304-310; 19, pp. 331-337).—In the first article the results are reported of examining, by the Anderson and McClintic method of standardization, 43 commercial disinfectants, the names and chemical nature of which are given. The *Bacillus typhosus* was the culture used throughout the tests.

The second article reports a comparative study made of the Rideal-Walker method, the Anderson and McClintic Hygienic Laboratory method, and the latter method as simplified by introducing the Rideal-Walker method of calculating the coefficient, as it was found that the coefficient was less liable to variation when calculated from the dilutions which cause sterility in $7\frac{1}{2}$ minutes. This modification produces a method which is very similar to that of Rideal, noted above. The disinfectants used were chlorin, liquor cresolis comp. U. S. P., thymol, and disinfectant B.

"An examination of the results shows that, using the Rideal-Walker method, the phenol coefficient of 4 different disinfectants, as shown by 10 duplicate tests, varied from 10.8 to 22.5 per cent. With the Hygienic Laboratory method the variation was from 6.5 to 11.9 per cent, while with the modified method the coefficient varied from 3.4 to 6 per cent. In the light of these facts it seems that the experimental error is less in the Hygienic Laboratory method than in the Rideal-Walker test. With the modification described, however, much more constant results are obtained than with either of the old methods."

The third article gives the results of a series of experiments from which may be drawn the facts applicable to any method for testing the power of disinfectants which uses the *Bacillus typhosus* as a test organism. The experiments were carried out for the purpose of ascertaining the probable manipulations of the test organisms in order to obtain a culture of uniform resistance to the action of the disinfectants.

A slight variation in temperature may so affect the vitality of the test culture that the values found are not comparable to coefficients previously obtained, and the variations must not be more than 0.2° C. Wider variations in results may also be found when proper attention is not paid to the length of time that the test cultures are grown upon standard extract broth, and furthermore if different strains of *B. typhosus* are used.

The author believes *B. coli* to be preferable to *B. typhosus* as the test organism, providing a strain which has a uniform relative resistance to the action of disinfectants is used. If this organism was employed there would be no chance of accidental infection of the worker, and possible errors due to contamination could be checked up by subculturing in a lactose-peptone-bile medium. Some preliminary comparative tests between the *B. typhosus* and *B. coli* were made for the purpose of studying this point.

On the carbohydrates of the shoots of *Sasa paniculata*, K. MIYAKE and T. TADOKORO (*Jour. Col. Agr. Tohoku Imp. Univ.*, 4 (1911), No. 6, pp. 251-259).—"The principal constituents of the shoots are carbohydrates which form about 50 per cent of the dry matter. The chief carbohydrates of the shoots are pentosan, cellulose, and sugar. Galactan, methyl pentosan, and starch are not present. Pentosan of the shoots is made up of both xylan and araban, the former, however, predominating in amount over the latter. Glucose and sucrose seem to compose the principal sugar in the shoots; the former is present in much larger quantity than the latter."

The preparation of levulose by biochemical methods, A. FERNBACH and M. SCHOEN (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 1, pp. 84-86).—

The gum produced by the gum-producing bacterium is considered *levulan*. Upon hydrolysis with an acid, this compound yields a substance which reduces Fehling's solution, and the figures obtained correspond to those given by levulose. See also a previous note by Owen (E. S. R., 25, p. 110).

Phosphorus compounds of cotton-seed meal and wheat bran, J. B. RATHER (*Texas Sta. Bul. 156, pp. 3-18*).—This continues work noted in a previous bulletin (E. S. R., 27, p. 611), in which it was pointed out that the phosphorus compounds of cotton-seed meal were nearly all organic in nature and furthermore that cotton-seed meal does not contain meta- or pyrophosphoric acid.

Inasmuch as the inorganic bases could not be removed completely by the Patten and Hart method (E. S. R., 16, p. 18), any formula based on a preparation obtained by this or a similar method is deemed open to question. In addition, attention is called to the fact that very few of the investigators working on this problem have made any attempt to determine whether or not the phytin under examination was a homogeneous preparation.

In the present investigation a modification of the modified Patten and Hart method was used, as follows: "Two kg. of cotton-seed meal was digested with 8,000 cc. 0.2 per cent hydrochloric acid for 3 hours with frequent shaking. The extract was strained through cheesecloth and the residue washed well with water. The residue was digested with 8,000 cc. 0.2 per cent ammonia for 3 hours with frequent shaking and allowed to settle, and washed with water by decantation. Copper acetate was added to the acid extract of the cotton-seed meal in sufficient quantity to precipitate most of the phosphorus compounds, the precipitate was washed well with water, decomposed with hydrogen sulphid, filtered, and evaporated to a sirupy consistency.

"The product was dissolved in a small amount of water and about 10 times the volume of ammonia added. The mixture was allowed to stand over night. The precipitate was filtered off. The filtrate from the precipitation with ammonia was evaporated on the water bath to remove the ammonia and taken up with water. Barium chlorid was added and the resulting precipitate was filtered and washed with water. The barium salts were decomposed with sulphuric acid and filtered. The filtrate was again made alkaline and precipitated with barium chlorid. This process was repeated 2 or 3 times and the acid finally precipitated with copper acetate in acid solution, the copper salt decomposed with hydrogen sulphid, filtered, and evaporated to a small volume. A large volume of alcohol was then added and the resulting precipitate filtered off. The alcohol was evaporated from the filtrate and the product taken up in a small volume of water. The ammonia extract of the cotton-seed meal was made acid with hydrochloric acid, the precipitate allowed to settle, and the liquid decanted through a filter. This extract was precipitated with copper acetate, ammonia, barium chlorid, and alcohol exactly as described for the acid extract. In the examination of the wheat bran, the ammonia extraction of the feed was omitted."

"The purpose of the precipitation with ammonia and with alcohol was to remove inorganic phosphorus and inorganic bases. It was found by analysis that this result was accomplished."

The product obtained with the modified method was very low in iron, calcium, and aluminum phosphates and was apparently homogeneous. The silver salts obtained from the acid and ammonia extracts of cotton-seed meal and from the acid extract of wheat bran were found to be free from pentosans and nitrogen, and the analytical figure showed the formula of the free acid to correspond to $C_{12}H_{41}P_3O_{42}$. "These results are not in accord with the conclusions of Patten and Hart [E. S. R., 16, p. 18], who claim that wheat bran con-

tains an inosit-phosphoric acid corresponding to the formula $C_2H_5P_2O_6$, nor with those of Anderson [E. S. R., 28, p. 505], who claims that cotton-seed meal contains an acid of similar composition, nor with those of Anderson [E. S. R., 28, p. 17] claiming that wheat bran contains an inosit-phosphoric acid of the formula $C_{20}H_{35}P_2O_{14}$."

The decomposition products of the crude free acids obtained from cotton-seed meal by the acid and ammonia treatment were sufficiently pure to be recognized as inosit. It is concluded that the inosit-phosphoric acid of wheat bran and cotton-seed meal are identical.

"Probably two-thirds of the inosit-phosphoric acid of cotton-seed meal is not soluble in 0.2 per cent acid, but is soluble in water. It is not soluble in water after extracting the material with acid, but may be dissolved in 0.2 per cent ammonia. The inosit-phosphoric acid of feeding materials is therefore not necessarily confined to the acid extract, which has formerly been assumed."

It is also concluded that there is probably no evidence "that wheat bran contains an inosit-phosphoric acid with pentose in the molecule. There is also no evidence that cotton-seed meal contains such an acid." The presence of pentose in the product isolated by others is believed to be due to the use of faulty methods. "The formula $C_{12}H_{21}P_2O_{12}$ is proposed for inosit-phosphoric acid, or the so-called 'phytic acid' of feeding materials."

See also a previous note (E. S. R., 27, p. 712).

Report in regard to the work done in the field of milk chemistry and dairy technology during the first half of 1912, GRIMMER (*Milchw. Zentbl.*, 41 (1912), Nos. 18, pp. 563-569; 19, pp. 584-592).—This includes work in animal husbandry, milk production, the various kinds of milk, changes taking place in milk and their constituents, bacteria in milk, enzymes, immune bodies, milk as an antigen, rennet and rennet coagulation, milk as a food, dairy products, dairy apparatus, shipping milk, and methods of examining milk.

Papers from the chemical laboratory of the New York State Station, L. L. VAN SLYKE and A. W. BOSWORTH (*Jour. Biol. Chem.*, 14 (1913), No. 3, pp. 207-236).—The papers noted are as follows: Preparation and composition of basic calcium caseinate and paracaseinate (pp. 207-209); preparation and composition of unsaturated or acid caseinates and paracaseinates (pp. 211-225); valency of molecules and molecular weights of casein and paracasein (pp. 227-230); composition and properties of the brine-soluble compound in cheese (pp. 231-236). These have been previously noted from another source (E. S. R., 29, p. 9).

The action of rennin on casein, A. W. BOSWORTH (*New York State Sta. Tech. Bul.* 31, pp. 3-7; *Jour. Biol. Chem.*, 15 (1913), No. 2, pp. 231-236).—The conclusions drawn from this investigation are as follows:

"A solution of calcium caseinate neutral to litmus and free from all other salts is not curdled by rennin. A solution of calcium caseinate acid to litmus, which contains 2 equivalents of base for each molecule of casein, is curdled by rennin. Solutions of ammonium, sodium, or potassium caseinates are not curdled by rennin. In such solution however the casein is changed to paracasein, the paracaseinates of these bases being soluble. When paracasein is produced from casein by the action of rennin, no other substance is formed. Two molecules of paracasein are produced from each molecule of casein as a result of this action.

"Rennin is not, strictly speaking, a coagulating ferment; the coagulation being a secondary effect, the result of a change in solubilities. Rennin action is probably a hydrolytic cleavage and may be considered the first step in the proteolysis of casein. It would follow from this that the action now attributed

to rennin may be produced by any proteolytic **enzym**. Work along this line is being carried out by the author.

"In the light of the results reported in this paper, together with those of Van Slyke and Bosworth [see above], the **rétarding** action of soluble salts of ammonium, sodium, and potassium on the coagulation of milk or casein solutions by rennin may be explained as follows: The addition of salts of these bases to milk or casein solutions results in a double decomposition whereby the calcium caseinate is changed to a caseinate of the base added. These are converted to paracaseinates by rennin, but owing to the fact that all the paracaseinates of these bases are soluble, no coagulation results."

The copper sulphate serum prepared with milk according to Lythgoe, E. ACKERMANN and C. VALENCIEN (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 24 (1912), No. 10, pp. 612-614).—The authors conclude that the method recommended by Lythgoe (*E. S. R.*, 24, p. 514) for preparing milk serum for refractometric purposes in the examination of milk for the purpose of detecting added water has no advantages over the calcium chlorid method. It yields a very clear serum in the cold, but about 20 per cent of its accuracy is lost by the dilution of the milk serum.

The casings of the milk fat globules, G. A. BREDEBERG (*Abhandl. Agr. Wiss. Gesell. Finland*, 1912, No. 4, pp. 62).—The results obtained with whole milk, cream, butter, and olive oil show that at least 2 kinds of casings or membranes can be prepared with fat droplets, and that these processes play a greater part than has been previously supposed. A butter emulsion, for instance, if free fatty acids are present, will form a casing with lime water. This is due to the formation of a compound between the calcium and oleic acid, butyric acid, etc.

The protein content of the casing (9 to 13 per cent) is not a part of the casing substance, but simply represents particles of casein which are distributed throughout the butter. Samples of gravity fat obtained from skim milk were found to be much lower in calcium and higher in protein than the casing substance from the globules of the butter. The traces of fatty acids which are also present in fresh milk take part in the formation of the membranes. When a large amount of calcium is present in the casings, the formation of insoluble lime salts must also be considered. The high calorific value of the casing substance indicates a nitrogen-free organic material.

The reaction of milk to certain reagents, BORDAS (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 18 (1912), Sect. VIIIc, pp. 69-72; *abs. in Chem. Ztg.*, 36 (1912), No. 134, p. 1312).—The blue coloration produced in milk with hydrogen peroxid and paraphenylendiamin is not due to a simple oxidation process, but to the action of a substance intermediate between paraphenylendiamin and quinone upon the calcium salts. The reaction proceeds in 2 stages: (1) The paraphenylendiamin is oxidized by a catalytic process; (2) the oxidation products bring about the blue coloration through the agency of the calcium salts.

According to present theories fresh milk contains **enzym**s which are capable of decomposing hydrogen peroxid, and the blue coloration is due to the resulting liberation of oxygen. It is, however, a known fact that a milk heated to 80° C. is not capable of liberating oxygen from hydrogen peroxid. According to the author, if such a milk is centrifuged, the catalyzer can be isolated, and this catalyzer, when added to homogenized milk which has been previously heated to 80°, produces a reaction with paraphenylendiamin, although it is much weaker than the one given by fresh milk.

The inhibition of the reaction in heated milk is probably due to some alteration in its physical condition. Evidently the catalyzer is an organometallic compound which acts chemically but not biologically.

The original acidity of milk, BORDAS (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 18 (1912), Sect. VIIIc, p. 67; *abs. in Chem. Ztg.*, 36 (1912), No. 134, p. 1312).—The lack of harmony in the various views concerning the reaction of milk is thought probably due to interpreting the results on the basis of different indicators. The author believes the most appropriate indicator is phenolphthalein. The total acidity of milk is chiefly due to free casein. Fresh milk never contains a free acid as lactic acid, or citric acid, or any acid salt. When there is an increase of acidity as a result of the decomposition of lactose, the calcium salt of casein is decomposed before the lactic acidity is manifest.

A simplification in the method for determining nitrogen, R. NEUMANN (*Chem. Ztg.*, 36 (1912), No. 66, p. 613).—It is shown in this work that the use of a standardized solution of sulphuric acid in the distillate receiver is unnecessary, because no measurable losses of ammonia occur. All that is required is a standard acid solution for titrating the collected ammonia and the use of the proper indicator. As an indicator to be used for all substances exclusive of the salts of ammonia, litmus tinctures, prepared according to Mohr's or Püschel's method, are recommended, but on account of the expense in the preparation of Püschel's, Mohr's tincture is preferred. When the nitrogen is to be estimated in ammonia salts cochineal is to be used, but the nitrogen factor must be corrected accordingly.

Quantitative separation of potassium from sodium, P. MARTINI (*Rend. Soc. Chim. Ital.*, 2. ser., 4 (1912), No. 6, pp. 113-116).—This is a modification of the Cunningham and Perkin method,^a and is of particular value when a large excess of sodium is present. The reagent required is composed of crystallized cobalt acetate 90 gm., sodium nitrite 230 gm., and acetic acid (specific gravity 1.04) 200 cc., and made up to 1 liter with distilled water. The procedure is as follows:

To 100 cc. of the solution, containing the potassium and sodium salts in the form of chlorides, 50 cc. of the above reagent and 200 cc. of 96 per cent alcohol are added, stirred, allowed to stand for 24 hours, decanted through a Gooch crucible holding a disk of very thin filter paper, and washed with a little 80 per cent alcohol. The precipitate and the ash of the incinerated disk of filter paper are dissolved in hydrochloric acid, the solution is evaporated in a porcelain dish on a water bath, and a small amount of an aqueous solution of perchloric acid is added. The potassium is weighed as potassium perchlorate according to Schloesing's method.

New methods for the determination of sodium and crude fiber, E. B. FORBES, F. M. BEEGLE, and J. E. MENSCHING (*Ohio Sta. Bul.* 255, pp. 211-216).—The method for sodium is proposed because with the official method it is often difficult to free the combined sodium and potassium sulphates from phosphates. The procedure is as follows:

"(a) Digest sample with nitric and sulphuric acids in a Kjeldahl flask as for a phosphorus estimation (the sulphuric and nitric acid digestion seems not to introduce a perceptible error through the solution of the Jena glass flask in which this process is conducted); make the solution up to volume; take for the determination such aliquots as will represent 2 to 4 gm. each of the fresh substance, and neutralize with ammonia; or (optional): (b) Moisten the sample

* Jour. Chem. Soc. [London], 95 (1909), II, pp. 1562-1569.

with dilute sulphuric acid and burn at a temperature below red heat. Digest the ash in dilute hydrochloric acid and filter; bring the filter paper and residue to dryness in a platinum dish, ignite, digest in hot water, filter, and add the filtrate to the one resulting from the first ignition; make the solution up to volume, and take for the determination such aliquots as will represent 2 to 4 gm. each of the fresh substance.

"Precipitate the phosphorus with magnesia mixture and 10 cc. of ammonia. Allow to stand over night and filter. Evaporate the filtrate to a low volume, transfer to a platinum dish, bring to dryness, and continue heating on a sand bath until ammonia fumes are evolved; then burn off all ammonium salts over a flame. Take up the residue in the platinum dish with hot water, transfer to a beaker, and heat; then add enough freshly prepared barium hydrate solution completely to precipitate the magnesium. Let the precipitate settle for a few minutes and test for complete precipitation. When no further precipitation is produced, filter and wash thoroughly with hot water. Heat the filtrate to boiling, make alkaline with ammonia, and add ammonium carbonate to precipitate the barium, calcium, etc. Filter, add a drop or two of hydrochloric acid and 1 cc. of ammonium sulphate solution (75 gm. per liter) and digest for several hours on a steam bath. Transfer into a platinum dish, evaporate to dryness and ignite; dissolve in hot water and filter into a weighed platinum dish, in which evaporate, ignite, heat to constant weight, and weigh as sodium and potassium sulphates."

Some results of comparative tests with the new and official methods are included, which were made with distillers' grains, snakeweed, cotton-seed meal, and brewers' grains.

The method for crude fiber has been previously noted from another source (E. S. R., 29, p. 506).

The estimation of carbon dioxid in water, J. CASARES and S. PIÑA (*Abs. in Chem. Ztg.*, 36 (1912), No. 73, p. 688).—In numerous tests with sodium carbonates in solutions of known concentration of carbon dioxid, the average error was 6 times larger than that reported by Winkler. Tests with diluted sodium carbonate solutions gave errors up to 50 per cent, so that the method can be considered only approximate, and is of no value for solutions containing small amounts of carbon dioxid.

Detection of saccharose in various branches of analytical practice, S. ROTHENFUSSER (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 24 (1912), No. 9, pp. 558-570).—This is a discussion of the author's method (E. S. R., 22, p. 10) for detecting saccharose in must, wine, beer, milk, cream, honey, infant foods, bakers' goods, and color malt.

About a method for determining tartaric acid in the presence of metals which may form complex salts, A. KLING and D. FLORENTIN (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 1 (1912), Sect. I, pp. 237-249; *abs. in Chem. Ztg.*, 36 (1912), No. 134, p. 1301).—In work previously reported (E. S. R., 23, p. 418) the senior author proposed a method in which the tartaric acid is precipitated as calcium racemate. This is practically insoluble in water and dilute acetic acid, but easily soluble in dilute mineral acids.

If to an alkaline tartrate or dextrorotatory tartaric acid (which is the only form which occurs in nature) an excess of ammonium tartrate is added, and then some calcium acetate, the entire tartaric acid is precipitated as dextrorotatory calcium racemate. It is of course necessary that there be no free mineral acid in the solution. As the precipitate always takes with it a certain amount of levorotatory calcium tartaric, it is necessary to redissolve it and

reprecipitate with sodium acetate. The precipitate is then titrated in a sulphuric acid solution with potassium permanganate.

The method will yield very good results if no metals are present which form complexes with the tartaric acids. If iron, aluminum, and antimony are present, low results are obtained, but this error can be obviated if citric acid is added. The method is deemed a good one for determining tartaric acid in argols, yeast, wine, beer, and in pears.

About a simple method of preparing lecithin emulsions, and the determination of their strength, J. C. SCHIPPERS (*Biochem. Ztschr.*, 40 (1912), No. 1-2, pp. 189-192; *abs. in Zentbl. Expt. Med.*, 1 (1912), No. 16, pp. 730, 731).—After describing the procedure for producing lecithin emulsions, the author describes a method for determining their strength, as follows: Ten cc. of the emulsion is added to a solution consisting of potassium bichromate 5 gm., 38 per cent hydrochloric acid 300 cc., and water to make 1 liter, and heated carefully in a wide-mouthed stoppered bottle at 90° C. for 6 hours. After cooling, 10 cc. of a 5 per cent potassium iodid solution is added, and 2 hours later 30 cc. of water and titrated with twenty-fifth-normal sodium thiosulphate solution. The indicator is a starch solution freshly prepared.

The sodium chlorid solution used in preparing the emulsion is also titrated, and the results obtained are subtracted from those gotten from the titration of the lecithin emulsion.

Investigations of the determination of dry substance in root crops, A. MADSEN-MYGDAL and P. CHRISTENSEN (*Tidsskr. Landbr. Planteavl*, 19 (1912), No. 3, pp. 453-532, figs. 2).—The investigations were conducted during 1907-1912 for the purpose of studying the various factors that have a bearing on the accuracy of the methods used in the determination of the dry substance in different root crops, especially mangels. There were considered in this connection the method of sampling, treatment of the pulp, size of sample, period and temperature of drying, changes in the composition of the pulp (especially sugar) during the drying process, factors that influence the changes in the sugar of the pulp, etc.

The sugar in ruta-bagas and turnips was found to reduce copper hydroxid and is probably invert sugar. The sugar in mangels in the fall is present as sucrose, and only during the winter and toward the spring is hydrolyzed with the formation of invert sugar. On continued drying the latter sugar is decomposed, this resulting in the formation of water or other volatile substances, and introducing an error in the results obtained for dry matter. Sucrose, on the other hand, is not changed during the drying process, so that pulp of mangels may in the fall be heated at from 95 to 98° C. for 24 hours.

On the basis of the results obtained in the investigation, the authors give at the close of the paper a detailed description of the method for determining dry matter in roots.

A word in regard to the nutrient salt question.—Determination of the ash constituent of foods, R. BERG (*Chem. Ztg.*, 36 (1912), Nos. 55, pp. 509-511; 56, pp. 523, 524).—After pointing out some of the incongruities which appear in the literature pertaining to the metabolism of the mineral constituents of foods, the author gives his methods for the determination of ash and the individual ash constituents. The methods given include iron, aluminum, calcium, magnesium, phosphoric acid, potassium, sodium, chlorin, sulphuric acid, nitric acid, and ammonia.

Recommendations for the revision of the milk section in the Swiss food book (*Milchw. Zentbl.*, 41 (1912), Nos. 19, pp. 598-603; 20, pp. 630-632).—This deals with definitions of milk, methods of sampling, qualitative and quantitative tests for examining milk, which include tests for preservatives, and bacteriological tests.

The determination of saccharose in condensed milk, H. NOWAK (*Ztschr. Analyt. Chem.*, 51 (1912), No. 10-11, pp. 610-614; *abs. in Chem. Ztg.*, 36 (1912), No. 132, *Repert.*, p. 593).—The author finds that Jolles' method (*E. S. R.*, 24, p. 704) can be used for the determination of saccharose in condensed milk. The solution must not contain more than 1.5 per cent of lactose.

Detection of small amounts of coconut fat in butter, L. ROBIN (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 18 (1912), Sect. VIIIc, pp. 305-307; *abs. in Chem. Ztg.*, 36 (1912), No. 134, pp. 1311, 1312).—The saponification number of the fatty acids contained in coconut fat is much higher than that of butter, so that the author finds it impossible to detect thereby as little as 5 per cent of coconut fat in butter. The determination of the water soluble and insoluble fatty acids, however, will give more satisfactory results.

If the saponification number of the butter is designated as A , the amount of acids soluble in water as B , the saponification number of the acids soluble in water as a , and the acids insoluble in water as b ; and the ratios $A:B=R$ and $a:b=r$ are determined, the R of pure butter is less than r . If an addition of 5 per cent of coconut fat is made to butter, R will be greater than r ; b and B can be easily determined by the author's method.

Proposals for the unification of analytical methods for cheese.—II, Determination of water in cheese, C. MAI and E. RHEINBERGER (*The Hague: Study Com. Internat. Dairy Fed.*, 1913, No. 2, pp. 11, fig. 1).—A translation of the article previously noted (*E. S. R.*, 28, p. 612).

The quantitative determination of methyl alcohol in mixtures containing ethyl alcohol, especially in brandies, W. KOENIG (*Chem. Ztg.*, 36 (1912), No. 109, pp. 1025-1027, fig. 1).—This is a modification of T. E. Thorpe's and I. Holmes's oxidation method (sulphuric acid and bichromate of potash), and it makes use of J. König's apparatus, which is employed for determining carbon dioxid, especially in organic carbon.

The estimation of rice spelts (hulls) in feeding stuffs, A. GRETE (*Abs. in Chem. Ztg.*, 36 (1912), No. 88, p. 842).—The silicic acid method alone for determining whether feeding stuffs contained rice hulls (*E. S. R.*, 24, p. 310) was found unreliable. The crude fiber determination can be used in connection with it, but the results obtained are not always entirely satisfactory. As the latter procedure is very tiresome, it is proposed to simplify the method by using the figures obtained from the residue which remains after boiling the material with ammonia. In this case it is necessary to know the average residue yielded by feeding stuffs of known composition (mixtures, etc.). For example, if the residue of rice spelts which has been leached with ammonia is 75.5 per cent, and the residue of a rice feed meal, treated in the same manner, is 25 per cent, the formula is $X+Y=S$ (substance), and $X.0.25+Y.0.755=R$ (weighed residue).

About the various methods employed for determining nicotin in tobacco and tobacco extracts, J. TÓTH (*Chem. Ztg.*, 36 (1912), No. 99, pp. 937, 938).—The author finds that the method devised by Bertrand and Javillier (*E. S. R.*, 27, p. 14) can be used for determining the nicotin in tobacco or in tobacco extracts, and is of particular value where ammonia and pyridin are present. Its disadvantage lies in the fact that it is expensive to conduct and cumbersome. In this regard the author does not agree with Chapin (*E. S. R.*, 25, p. 16).

The determination of nicotin in concentrated tobacco juices, F. PORCHET and P. TONDUZ (*Abs. in Chem. Ztg.*, 36 (1912), No. 88, p. 843).—A comparative study was made between the Ulex method (*E. S. R.*, 25, p. 211), and the Biel and Tóth methods.

It is shown that in fluids of low density, which compare well with the density of commercial preparations of nicotine, practically the same results are obtained with all 3 methods. Substances with a heavy density, however, behave differently. The lowest results were obtained with Tóth's method, with Biel's next, and the highest with the Ulex method. Juices containing from 7 to 10 per cent of nicotine may show differences as high as 1.5 per cent when Tóth's and Ulex's methods are compared.

Laboratory handbook for the oil and fat industry, J. MARCUSSEN (*Laboratoriumsbuch für die Industrie der Öle und Fette. Halle, 1911, pp. XII+146, figs. 21*).—This is principally a book of methods for the examination of fats, oils, soaps, varnishes, lacquers, oil colors, oxidized and blown oils, and lubricating oils.

The fatty oil and the wax of coffee beans, H. MEYER and A. ECKERT (*Monatsh. Chem., 31 (1910), No. 10, pp. 1227-1251*).—The results are reported of a physical and chemical examination of these substances in the coffee bean.

Lumbang oil, R. W. DARNER (*North Dakota Sta. Spec. Bul., 2 (1913), No. 19, pp. 337-339*).—Analyses of nuts of the lumbang tree, *Aleurites triloba* or *A. moluccana*, obtained from the Philippines and the Hawaiian Federal Station, are reported, together with analyses of the oil therefrom in comparison with values obtained by other investigators under the name of "candlenut oil." There seemed to be a wide variation in the iodine numbers as determined by the different analysts, which may be due to the fact that oils derived from different species of the same family are being sold under one name. The drying properties of the oil indicated that it can well be used in the paint and varnish trade. See also a previous note (E. S. R., 28, p. 714).

METEOROLOGY—WATER.

Weather and water, M. HOFFMANN (*Jahresber. Landw., 27 (1912), pp. 1-24*).—Recent investigations on these subjects are classified and reviewed as usual.

The action of the wind and its significance in agriculture, H. K. STAMM (*Internat. Mitt. Bodenk., 3 (1913), No. 1, pp. 50-66; abs. in Rev. Sci. [Paris], 51 (1913), II, No. 12, pp. 367-370*).—This is a discussion of the subject based upon a report by Free and Stuntz (E. S. R., 25, p. 424), emphasizing especially the means which may be adopted to reduce the damage done by wind erosion.

The relation of the soil to meteorological factors, III, IV, E. G. LOSKE (*Trudy Selsk. Khoz. Met., 1912, No. 9, I, pp. XIV+105-334*).—This is part 1 of a review (in the Russian language) of work in agricultural meteorology and related questions, issued by the Meteorological Bureau of the Scientific Committee of the Ministry of Agriculture of Russia. The review contains a bibliography of the literature of the subject.

The influence of climatic conditions on agriculture in Germany, A. SCHNIDER (*Landw. Hefte, 1912, No. 1, pp. 27; abs. in Internat. Mitt. Bodenk., 3 (1913), No. 1, p. 74*).—This article deals with the different active climatic factors, such as rainfall, temperature, wind, etc., especially in their relation to various farm operations.

The climate of Utah as a resource, A. H. THIESSEN (*Bien. Rpt. Utah Conserv. Com., 1 (1913), pp. 132-145, figs. 3*).—This is a review of the climatic conditions of Utah, in which it is stated that the mean annual temperatures range from 40° F. in the extreme north to nearly 60° in the extreme southern part of the State. The annual precipitation varies from 6 to 20 in., most of the moisture falling during the winter and spring. A large part of this is said to be conserved for irrigation purposes.

Monthly Weather Review (*Mo. Weather Rev.*, 41 (1913), Nos. 7, pp. 967-1130, pls. 11; 8, pp. 1131-1284, pls. 9).—In addition to the usual climatological summaries, lake levels, weather forecasts and warnings for July and August, 1913, river and flood observations, notes on the rivers of the Sacramento and Lower San Joaquin watersheds during July and August, 1913, by N. R. Taylor, lists of additions to the Weather Bureau library and of recent papers on meteorology, a condensed climatological summary, and climatological tables and charts, these numbers contain the following special papers:

No. 7.—Thunderstorm of July 30, 1913, at Washington, D. C., by P. C. Day; Local Storms of July 19, 1913, in Virginia, by J. H. Kimball; Destructive Storms of July 13-14 in Ohio, by J. M. Kirk; The Development of Water Power in Wisconsin, and the Relation of Precipitation to Stream Flow (illus.), by W. R. Bormann; Dry Periods in Louisiana, by E. D. Coberly; Mock Suns, by H. H. Martin; Note on the Weather at Point Reyes, by J. Jones; Forecasting the Water Supply in California, by A. G. McAdie; The Annual Rise of the Columbia River, by T. R. Reed; Flood at Boise, Idaho, by E. L. Wells; and Windstorm at Seattle, Wash., by G. N. Salisbury.

No. 8.—Drought of 1913 in New York, by W. M. Wilson; Severe Thunderstorm at Macon, Ga., by W. A. Mitchell; Stevens Creek Power Development on the Savannah River, by E. D. Emigh; Severe Storm at Dubuque, Iowa, by J. H. Spencer; The Drought in the Meramec, Arkansas, and Red River Drainage Basins, Summer of 1913, by I. M. Cline; Midsummer Showers at Galveston, Tex., by W. P. Stewart; and Notes on Streams and Weather of the Upper San Joaquin Watershed, by W. E. Bonnett.

Report of the Iowa weather and crop service for 1911, G. M. CHAPPEL (*Iowa Yearbook Agr. 1911*, pp. 1-37, fig. 1).—Monthly reports "from 118 cooperative meteorological stations, and from the U. S. Weather Bureau stations at Des Moines, Davenport, Dubuque, Charles City, Keokuk, and Sioux City, Iowa, and Omaha, Nebr.," are summarized.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and E. K. DEXTER (*Massachusetts Sta. Met. Buls.* 297, 298, pp. 4 each).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during September and October, 1913, are given. The data are briefly discussed in general notes on the weather of each month.

Meteorological records for 1912 (*New York State Sta. Rpt. 1912*, pp. 875-886).—Tables are given showing tri-daily readings at Geneva, N. Y., of standard air thermometers for each month of the year; daily readings of maximum and minimum thermometers at 5 p. m. for each month of the year; a monthly summary of maximum, minimum, and standard thermometer readings; monthly and yearly maximum and minimum temperatures from 1883 to 1912, inclusive; average monthly and yearly temperatures since 1882; and rainfall by months since 1882.

Meteorology for twenty years, H. G. KNIGHT and J. C. FITTERER (*Wyoming Sta. Bul. 100*, pp. 27-88, pl. 1, figs. 36).—Observations on temperature, precipitation, and humidity are summarized in detail for Laramie at an approximate elevation of 7,190 ft. above sea level. Observations on temperature, precipitation, sunshine, and wind for other places in Wyoming are also summarized.

The mean annual temperature at Laramie, 1891-1910, was 40.6° F., the highest 92°, the lowest -42°. The mean annual precipitation was 10.21 in., the mean humidity 61.4 per cent.

The mean annual temperature for the State was 42.2° F.; the mean annual precipitation 13.71 in.; the mean annual sunshine 66 per cent; the prevailing

direction of the wind during all months of the year was west. The average date of the last killing frost in spring varied from May 4 at Clark to June 3 at Rawlins; the date of the first killing frost in autumn from September 11 at Lander to October 14 at Clark.

Meteorological, magnetic, and seismic observations of the College of Belen of the Society of Jesus, Havana, 1911, L. GANGOITI (*Observatorio Meteorologico, Magnetico y Seismico del Colegio de Belen de la Compania de Jesus en la Habana, año de 1912. Havana, 1913. pp. 101, pls. 3*).—Detailed reports, largely tabular and diagrammatic, of the usual observations are presented.

Meteorological observations at the Ploti Experiment Station, 1912, M. MARTYNOV (*Godichnyi Otchet Ploti. Selsk. Khoz. Opytn. Stantsii, 18 (1912), pp. 1-76, 329-340, tables 2*).—Observations on temperature of the air and soil, atmospheric pressure, precipitation, cloudiness, and wind during 1912 are reported and discussed in relation to crop growth.

Annual report of the director of the [Philippine] Weather Bureau for the year 1910, J. ALGUÉ (*Ann. Rpt. [Philippine] Weather Bur., 1910, pt. 1-2, pp. 171*).—This contains the administrative report for the fiscal year 1910 and a record of hourly meteorological observations made at the central observatory during the calendar year 1910.

Precipitation and run-off, Ishikari River, Japan, with special relation to ice conditions, B. OKAZAKI (*Engin. News, 70 (1913), No. 18, pp. 850-852, figs. 3*).—Results are given of a long series of gage observations, discharge determinations, and precipitation records to determine the relation between annual run-off and annual precipitation in this basin. In addition a study of discharge measurements under ice conditions is noted.

The deficient rainfall in the summer of 1913 (*Engin. News, 70 (1913), No. 19, p. 905*).—Data for rainfall during May, June, July, and August in the corn and wheat belt and the Atlantic and Gulf States are summarized in tables.

"Of the States in the corn and wheat districts, Kansas and Missouri report the most abnormal conditions; each falls approximately 8 in. short of the usual summer rainfall. Minnesota is about normal, while Wisconsin is above by nearly 2 in. The section average is below normal for each month except May, when by some chance it was exactly normal. The average deficiency for the section was 3.64 in."

Among the Atlantic and Gulf States "Arkansas holds the drought record by falling more than 7 in. below the normal rainfall. The section average was consistently below normal during the entire summer; and the average deficiency for the section was 3.56 in. If, however, the Arkansas record were included with the corn and wheat belt group, where in some respects it perhaps more properly belongs, the average rainfall for the last named section would be even lower."

The relation of snow to irrigation and forestry, S. P. FERGUSON (*Sci. Con-spectus, 3 (1913), No. 5, pp. 152-157, figs. 9*).—This article calls attention to the importance to irrigation in semiarid regions of accurate information concerning the amount and density of snowfall.

Data from recent studies in the Sierra Nevada Mountains show a larger snow accumulation in forests than on bare slopes and also an appreciable difference in the amount retained by different kinds of trees, the fir and pine forests being superior to others.

The simplest method of determining mean snow depth has been by reading a number of graduated board gages. Of the several methods described for determining the water content of snow the method of measurement by section is said to be most economical and efficient.

The relative efficiency of talus slopes and forests in conserving snow for irrigation, J. E. CHURCH, JR. (*Engin. and Contract.*, 40 (1913), No. 16, pp. 441-443).—It is shown that on the forested slopes more snow is conserved, the run-off water and snow are conserved much later in the season, and a more considerable restraining influence is exercised on the sudden melting of snow, which causes floods, than on the deforested areas.

Pan and raft equipment for water evaporation tests (*Engin. Rec.*, 68 (1913), No. 18, p. 498, figs. 3).—This equipment is diagrammatically illustrated and briefly described.

Chemical analyses of waters (*California Sta. Circ.* 103, pp. 4).—Directions are given regarding the sampling of waters for the purpose of obtaining from the station chemical analyses to determine the suitability of the waters for irrigation and domestic purposes.

Elements of water bacteriology with special reference to sanitary water analysis, S. C. PRESCOTT and C. E. A. WINSLOW (*New York and London*, 1913, 3. ed. rewritten, pp. XIV+318, fig. 1).—In a "somewhat far-reaching revision" of their book, the authors state that since the second edition was published (E. S. R. 20, p. 423) "there has again been important progress along many lines in sanitary bacteriology," which "has made necessary a change in many details of current practice." More recent ideas on the effect of temperature on the viability of bacteria in water and new laboratory methods are included, as is also a new chapter on the bacteriological examination of shellfish.

The rationale and advantages of lime sterilization of water: Experimental data and conclusions, C. P. HOOVER (*Engin. and Contract.*, 40 (1913), No. 20, pp. 541, 542).—A review of service experiments with the excess lime method of water sterilization indicates that when enough lime (CaO) is added to water to absorb the free and half-bound carbon dioxide and to precipitate the magnesium content the bacteria of the colon and typhoid group are killed in 48 hours, providing large quantities of organic matter are not present. The germicidal action is effective in from 5 to 24 hours when an excess of from $\frac{1}{2}$ to 1 grain per gallon is added beyond that needed to reduce the temporary hardness to the lowest figure. The sterilizing action is attributed not to the toxic effect of lime but to the fact that intestinal organisms will not live in water containing no free or half-bound carbon dioxide.

Lime-softened water inoculated with typhoid organisms or with crude sewage soon becomes free from them. The action is said to be selective in that certain harmless bacteria grow but the disease-producing germs do not.

Purification of water supplies by the excess lime method, J. WATT (*Jour. State Med.*, 21 (1913), No. 8, pp. 489-499, figs. 2).—Three weeks' treatment of river water with approximately 3 parts of pure lime per 100,000 parts of water, the so-called excess lime method, greatly reduced the number of *Bacillus coli* and gave generally favorable results with the exception of a slight coloring and a slightly increased alkalinity.

It is concluded in general that excellent bacteriological results may be obtained by this method but that in the case of a soft water artificial carbonation and subsequent filtration will in most cases be necessary. "One of its most useful applications will be in the treatment of storm water in the case of towns which have not sufficient storage to allow them to discard such water. Further, in time of an epidemic where the water supply is the suspected source . . . one can confidently recommend . . . the adoption of the 'excess lime' method of purification on the grounds both of its effectiveness and of the simplicity of the arrangements necessary, and consequent rapidity with which it can be brought into operation."

Purification of water for residences, J. H. DUNLAP (*Proc. Iowa Engin. Soc.*, 25 (1913), pp. 69-79, figs. 3).—Data are quoted which indicate the sanitary value of the purification of water for household use, and a discussion is given of purification by chemicals, electricity, heat, and filtration. In connection with the last 2 methods several types of household apparatus are described.

The majority of household filters are considered valueless and from the results of a number of tests it is concluded that natural stone filters are to be avoided. As a final conclusion it is stated that the so-called Forbes sterilizer is a most practical device for boiling water, but for water containing an objectionable amount of suspended matter rapid or slow filtration with household apparatus is necessary. The subsequent sterilization may be obtained by either boiling or by filtration in the Pasteur or the Berkefeld filters, which consist of filtration tubes of unglazed porcelain and diatomaceous earth, respectively, providing these filters are sterilized daily.

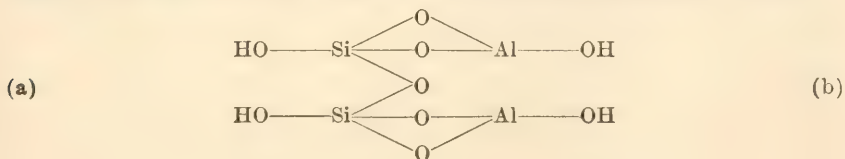
SOILS—FERTILIZERS.

Glaciation and soils, E. BARRETT (*Ind. Dept. Geol. and Nat. Resources Ann. Rpt.*, 36 (1911), pp. 11-30, pl. 1, figs. 7).—It is the main purpose of this article to discuss the Ice Age in its relation to the soils of Indiana. The Labradorian ice sheet in two of its stages, the Illinois and Wisconsin, is considered to have profoundly influenced the surface and soils of the northern three-fourths of the State with its two accumulations of drift. It is stated that glacial soils are generally rich in all the basic elements and that they are heterogeneous in material and arrangement, containing a relatively larger proportion of silt particles and less clay than soil formed by chemical processes from the same rock.

[Soil surveys in Indiana] (*Ind. Dept. Geol. and Nat. Resources Ann. Rpt.*, 36 (1911), pp. 33-468, pls. 17, figs. 25).—In a series of eight articles soil surveys by methods similar to those of the Bureau of Soils of this Department are reported of Hancock, Johnson, and Shelby counties, by A. D. Hole (pp. 33-82); Morgan and Owen counties, by J. B. Edmondson (pp. 83-134); Clay, Knox, Sullivan, and Vigo counties, by C. W. Shannon (pp. 135-280); La Porte, St. Joseph, and Bartholomew counties, by E. J. Quinn (pp. 281-334); Spencer, Warwick, and Scott counties, by A. W. Mangum and N. P. Neill (pp. 335-381); Posey County, by H. W. Marean (pp. 382-407); Greene County, by W. E. Tharp and C. J. Mann (pp. 408-446); and Marion County, W. J. Geib and F. C. Schroeder (pp. 447-468).

Deli soils, J. G. C. VRIENS (*Meded. Deli Proefstat. Medan*, 5 (1911), No. 9, pp. 327-335; 6 (1912), No. 8, pp. 293-296; 7 (1912), Nos. 5, pp. 171-173; 6, pp. 297-308).—This is a continuation of the report on analyses of tobacco soils previously noted (E. S. R., 25, p. 321).

Studies on acid soils of Porto Rico, O. LOEW (*Porto Rico Sta. Bul.* 13, pp. 23, fig. 1).—At the outset the author distinguishes between "soil acidity due to humic acids and that due to mineral compounds" as typically represented in Porto Rico by acid red clay soils. "The acid soils of Porto Rico owe their acidity not to humic acid but to an acid clay." This acid clay is designated argillac acid, and the author proposes for it the following structural formula:



"By neutralization of the acid hydroxyls at (a) the acid clay would become neutral. The absorption of phosphoric acid can be explained by the basic hydroxyls at (b). By prolonged treatment of neutral clay, i. e., salts of argillic acid, with large quantities of water, charged with carbon dioxid, renewed from time to time, an acid clay may be produced. On the other hand, the reverse action can take place, according to the law of mass, i. e., neutral salts may be decomposed by acid clay, the base being absorbed and the acid set free. This takes place to a certain extent even with potassium chlorid and ammonium sulphate. Hence, acid soils, fertilized with neutral salts, will often produce worse results than when not fertilized at all."

Certain typical acid soils were studied in some detail with special reference to the determination and correction of acidity and the relation of acidity to the biological activities in the soil. It was found that the acidity could best be determined "by treatment with sodium or potassium acetate and titration of the acetic acid set free. The butyric ferment was found in alkaline soils and in all acid soils tested, even to a depth of 18 in. in a very stiff acid clay soil. A measure for the relative content of the butyric ferment in soils can be obtained by comparing the amount of gas developed with different soils when placed with nitrogen-free glucose culture solution in a suitable apparatus." A simple apparatus for this purpose is described. "Azotobacter was found not only in moderately alkaline soils, but also in soils of considerable acidity. When, however, these acid soils consisted of a very stiff clay with deficient aeration it was absent. Liming of acid soils had a very favorable effect on the growth of Azotobacter. The limed soils yielded a luxuriant film of Azotobacter much sooner than the unlimed check plat did. This increase of Azotobacter is in accord with the observations that the nitrogen-fixing power of soils is increased by liming."

Soil acidity, H. O. BUCKMAN (*Cornell Countryman*, 10 (1913), No. 9, pp. 277-279).—This article comments briefly on so-called soil acidity, describing two forms, active and inactive or negative acidity. It states that for practical purposes soil acidity may be considered simply as a lack of basic matter in the soil. Field and laboratory tests for determining soil acidity and for estimating the necessary amount of lime treatment are also noted.

Preliminary note on the occurrence of acidity in highland soils, A. A. MEGGITT and A. G. BIRT (*Ann. Rpt. Agr. Expt. Stas. Assam*, 1912, pp. 37-41).—Previously noted from another source (*E. S. R.*, 28, p. 813).

The permeability of the soils of Egypt, AUDEBEAU (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 3, pp. 231-233; *abs. in. Rev. Sci. [Paris]*, 51 (1913), II, No. 5, pp. 154, 155; *Bul. Soc. Nat. Agr. France*, 73 (1913), No. 5, pp. 342-345).—The author states that from the viewpoint of the permeability of its soils Egypt is a vast mosaic. He classes the soils as permeable soils, soils of average or only light permeability, permeable soils with impermeable subsoils, soils more or less impermeable at the surface overlying permeable subsoils in underground communication with irrigation canals, and impermeable soils. He states that in the north of the Delta the clay strata are more plastic and impermeable than in the rest of the country, and that in most cases there is no communication between the upper alluvium and the deep sands. Only a considerable development of drainage and the use of mechanical means for elevating water will permit the rapid reclamation of the uncultivated lands in the north of Lower Egypt.

Concerning the south and center of Lower Egypt and also Upper and Central Egypt the author suggests the use of systems of drainage canals situated lower than and bordering on the lands irrigated and that the lands be irrigated by means of mechanical lifting devices throughout the greater part of the year.

The importance of colloid substances in the soil from an agricultural standpoint, P. ROHLAND (*Monatsh. Landw.*, 6 (1913), No. 9, pp. 263-265).—The relation of colloids to the physical and chemical properties and processes and biological activities in the soil is briefly discussed.

Bacterial activity in soil as a function of the various physical soil properties, O. RAHN (*Science, n. ser.*, 38 (1913), No. 977, pp. 414, 415).—This question was studied with pure cultures of *Bacillus mycoides* grown in quartz-sand peptone water mixtures, the amount of ammonia formed being taken as an indicator of the bacterial activity. Studies were also made with *Bacterium lactis acidi* grown in milk-sand mixtures, acidity and number of cells serving as a measure of development.

It is shown that conclusions from the results are greatly influenced by the basis of comparison used. The author concludes that the efficiency of bacteria can be determined only by comparing equal amounts of culture medium and of food. The bacterial activity is influenced greatly by the extent to which the medium is favorable or unfavorable to oxygen exchange, also by the thickness of the moisture film surrounding the soil particles, that is the thinner the film of moisture (within limits) the more rapid the changes. It is estimated that in arable soils with particles not more than 0.1 mm. in diameter, it would require more than 50 per cent of moisture to produce the optimum film thickness, so that it is probable that strictly aerobic bacteria will never find optimum conditions in soils. On imitating the effects of undecomposed organic matter by adding finely ground filter paper to sand, it was found that in fairly dry soils such addition of cellulose caused a decrease of ammonia formation by making some of the soil moisture unavailable for bacteria. In the moist sands the addition of cellulose increased ammonification, probably by holding the sand particles further apart, and thus increasing aeration.

The origin of certain organic soil constituents, M. X. SULLIVAN (*Science, n. ser.*, 38 (1913), No. 977, p. 414).—This is an abstract of a paper presented before the Society of American Bacteriologists.

It is reported that the following substances were found as products of the growth of *Penicillium glaucum* in Raulin's solution: Hypoxanthin, guanin, adenin, histidin, thymin, cholin, probably lysin, oleic and palmitic acids, a fatty acid melting at 54° C., hydroxy-fatty acids, cholesterol bodies, cerebrosid, mannite, pentose sugar, and unidentified aldehydes. Since most of these compounds have been found in soil, the conclusion is drawn "that in the formation of the various organic soil constituents, micro-organisms, such as yeasts, bacteria, and molds, play an important part."

Characteristics of cellulose-destroying bacteria, I. G. MCBETH, F. M. SCALES, and N. R. SMITH (*Science, n. ser.*, 38 (1913), No. 977, p. 415).—This is an abstract of a paper presented before the Society of American bacteriologists.

"The cellulose-destroying organisms are divided into the following groups: (1) Those which give an acid reaction from all of seven peptone carbohydrate solutions used, (2) those which give an alkaline reaction from all of the peptone carbohydrate solutions, (3) those which give an acid reaction from only a part of the peptone carbohydrate solutions, and (4) those which produce no change in the reaction of any of the peptone carbohydrate solutions."

Experiments on denitrification, F. V. CHIRIKOV and A. A. SHMUK (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou)*, 19 (1913), No. 2, pp. 270-286, pt. 1, figs. 3; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 10, pp. 1528, 1529).—The influence of moisture and increasing amounts of straw on the progress of denitrification in sandy loam soil was studied in these experiments.

The moisture content varied from 40 to 80 per cent of the water capacity of the soil. Oats either without addition of straw or with amounts varying from 0.25 to 1 per cent of the weight of soil in the pots grew best with a moisture content equivalent to 80 per cent of the water capacity of the soil. The moisture content remaining constant, the yield of oats decreased with increasing amounts of straw. The rapidity of decline in yield was greatest with 80 per cent of the water capacity, and appreciably decreased with a lowering of the water content.

The influence of the straw in diminishing the yield increased with the moisture content in presence of sodium nitrate as well as in presence of ammonium sulphate. The reduction of yield resulting from the addition of 0.25 per cent of straw was about the same as that resulting from a reduction of the moisture content of the soil to 20 per cent of its capacity.

The addition of calcium carbonate with the straw reduced to an appreciable extent the injurious effect of the latter, but did not wholly overcome it. The maximum beneficial effect of the calcium carbonate was obtained when it was used at the rate of 0.25 per cent of the weight of the soil.

Sugar, starch, and straw, in amounts of from 0.125 to 1 per cent, were used in sand cultures, and it was found that the smallest growth of mustard and oats was obtained in the culture to which sugar had been added, followed in order by starch and straw. The diminished growth resulting from the addition of these organic substances to the sand cultures was not due to denitrification in a strict sense, but to the fact that the nitrates in the soil were converted into albuminoid compounds which are less assimilable by green plants than nitrates. It was observed that the nitrogen content of the plants was higher the greater the reduction of growth. The addition of the organic substances in the presence of nitrates produced an alkaline medium in exact proportion to the amount of organic matter added.

Some relations of certain higher plants to the formation of nitrates in soils, T. L. LYON and J. A. BIZZELL (*New York Cornell Sta. Mem. 1, pp. 9-109, pls. 5, figs. 22*).—Investigations which showed that "the nitrate content of soil under timothy, maize, potatoes, oats, millet, and soy beans was different for each crop when on the same soil" are reported in detail. "There was characteristic relationship between the crop and the nitrate content of the soil at different stages of growth. During the most active growing period of the maize crop, nitrates were frequently higher under maize than in cultivated soil bearing no crop. Under a mixture of maize and millet, nitrates at this period were higher than under millet alone, although the crop yields were about the same on both plants. . . .

"Under both maize and oats the nitrate content was higher during the period when the crop was making its greatest draft on the soil nitrogen than in the later stages of growth, in spite of the fact that the nitrates in the uncropped soil were increasing while those in the cropped soil were disappearing. Nitrates under these crops and under millet failed to increase late in the season, when nitrogen absorption had practically ceased, although uncropped soil showed a very large increase in nitrates at that time. . . .

"Aside from the influence of cultivation, the source of the great differences in the nitrates under the crops mentioned may be sought in the inherent differences between plants of different species in their stimulating or inhibiting influence on the production of nitrates, as well as in their relative rates, amounts, and forms of nitrogen absorption.

"Changes in the moisture content or in the temperature of the soil after early summer had no important effect on the nitrate content of the soil under plants. On the uncropped soil an increase in moisture content was sometimes accompanied by an increase in nitrates and sometimes by a decrease.

"Determinations of the rate of nitrification of soil from plats planted to alfalfa and timothy, respectively, showed the alfalfa soil to nitrify more rapidly than the timothy soil, both in the soil on which the crops had been grown continuously and in that from which they had been removed and on which the soil had been kept bare for two seasons. The formation of nitrates was in the same order when the soils were incubated with dried blood. . . .

"Plats of land planted to certain crops in 1910 were kept bare of vegetation during the early part of the growing season of 1911. Determinations of nitrates in the soil of these plats showed a distinct and characteristic relation of the several plants to the nitrate content of the soil in the year following that in which the plants were grown.

"Maize was the only crop following which the nitrates in the previously planted soil were higher than in the unplanted soil. Potato soil was the next highest in nitrates, and oat soil contained least nitrates.

"Millet planted on these plats on July 1 was markedly influenced by the previous crops, but the luxuriance of growth was inversely proportional to the nitrate content of the plats. . . .

"Freezing and thawing produced a condition of soil favorable to nitrate formation. . . .

"Timothy maintained a lower nitrate content in the soil than did any other crop. Mixed grasses—*Phleum pratense*, *Agrostis alba*, *Poa pratensis*—gave much less nitrogen in the crop and the drainage water combined than was contained in the drainage water from unplanted soil. . . .

"Plants of two different kinds were grown, in combination and separately, in soil and in ground quartz containing nutrient solutions. In a considerable number of cases in which the plants were harvested at the blooming period or before, one or both kinds made a larger growth in the combinations than in the pure cultures, although there were at least twice as many plants growing in the mixed as in the pure cultures. This increased growth of one plant in association with another was apparently not due to any increased supply of nitrates, since the apparent stimulation of growth occurred with nutrient solution in which all the nitrogen was in the form of nitrates, as well as with the soil."

A bibliography is appended.

Nitrogen fixation by organisms from Utah soils, E. G. PETERSON and E. MOHR (*Science, n. ser.*, 38 (1913), No. 977, p. 416).—This is an abstract of a paper presented before the Society of American Bacteriologists.

"This paper is a preliminary note on a proposed extensive investigation regarding the fixation of nitrogen in Utah soils and the rôle played by micro-organisms in this action, together with the various agencies influencing bacterial action." Three forms were isolated. These are described and tests of their nitrogen-fixing power are reported. The seasonal variation in fixation "was found to be very marked from week to week without apparent regularity, a marked increase in fixation power being noted from the middle of May to the end of June."

The ammonifying efficiency and algal content of certain Colorado soils, W. G. SACKETT (*Science, n. ser.*, 38 (1913), No. 977, p. 416).—The paper, read before the Society of American Bacteriologists, of which this is an abstract, is published in full in Bulletin 184 of the Colorado Experiment Station (E. S. R., 28, p. 31).

Abnormal fixation of atmospheric nitrogen, C. T. GIMINGHAM (*Chem. World*, 2 (1913), No. 3, p. 84).—This is a brief critical review of the investigations by Headden and Sackett on the occurrence of excessive amounts of nitrates in Colorado soils.

Soil inoculation under soil conditions of lime deficiency, T. D. BECKWITH (*Science, n. ser.*, 38 (1913), No. 977, p. 414).—This is an abstract of a paper presented before the Society of American Bacteriologists.

It is stated that pure cultures of *Bacillus radicola* were distributed and tested in various parts of Oregon. On the soils of western Oregon, which are generally somewhat deficient in lime, 69 per cent of the tests were successful, while on soils of eastern Oregon, which are well supplied with lime, 90 per cent of the tests were successful.

The bread supply, C. G. HOPKINS (*Science, n. ser.*, 38 (1913), No. 979, pp. 479-481).—This is a discussion of an article by H. L. Bolley, on cereal cropping, which has already been noted (E. S. R., 29, p. 516).

The author emphasizes especially the importance of the chemical determination of plant food as a means of judging the productive capacity of soils.

Bread from stones, C. G. HOPKINS (*Illinois Sta. Circ.* 168, pp. 4; 2. ed. rev., pp. 8, figs. 5).—This circular describes the system used to improve a farm of poor gray prairie land in southern Illinois. The system followed during 10 years has included a 6-year rotation of corn, oats (or cowpeas), and wheat, and 3 years of meadow and pasture of clover and timothy. Two applications have been made of ground limestone (4 tons per acre) and rock phosphate (2 tons), and one of barnyard manure (6 loads).

Soil experiments on Caldwell field, T. L. LYON (*Cornell Countryman*, 11 (1913), No. 1, pp. 4-11, figs. 5).—This article describes the lay-out of plats and the methods and results of experiments on these plats, as well as a series of concrete soil tanks, on this field at New York Cornell Experiment Station.

Farm manures, C. E. THORNE (*New York and London*, 1913, pp. VII+242, figs. 23).—Since the publication of Harris's very practical "Talks on Manures" the experiment stations have accumulated a large amount of more exact data on the subject, which, however, are scattered in various bulletins and other publications. The object achieved in this book is the arrangement of this information in convenient form for ready reference and practical use. A few short introductory chapters treat in a more general way of the origin and composition of the soil and the feeding of the plant. The subject proper is discussed under the heads of composition, production, value, waste, preservation, reinforcement, and methods of applying manures; where to use manure; green manuring; and planning the farm management for fertility maintenance. Most of the facts presented have back of them the force of years of painstaking investigation, some of the most important and convincing of which has been carried on by the author at the Ohio Station.

Poultry manures, their treatment and use, H. D. HASKINS and L. S. WALKER (*Massachusetts Sta. Circ.* 35, pp. 4).—Analyses of samples of poultry manure obtained with different kinds of feeds, which had been subjected to different methods of handling and keeping are reported and methods of preservation are recommended. The results show that manure produced by fowls receiving animal food is richer in nitrogen than that of fowls receiving only grain food, and that manure unmixed with absorbents or chemicals suffers very rapid loss of nitrogen.

The action of green manures, O. MIELCK (*Fühling's Landw. Ztg.*, 62 (1913), No. 17, pp. 585-612, figs. 9).—The work of other investigators with reference to the action of the nitrogen of green manures and the secondary effects of green manuring is reviewed, and tests by the author on the comparative merits of different leguminous plants—horse beans, peas, vetch, crimson clover, etc.—are reported. The results of these tests favored the common vetch.

Fertilizers and fertilizing, M. HOFFMANN (*Jahresber. Landw.*, 27 (1912), pp. 60-94).—A classified review is given of recent reports of investigations on this subject.

Agricultural fertilizers and fish life, W. J. A. BUTTERFIELD (*Field*, 1913, May 17; *abs. in Jour. Soc. Chem. Indus.*, 32 (1913), No. 11, p. 618; *Chem. Abs.*, 7 (1913), No. 20, p. 3524).—Calcium nitrate, superphosphate, basic slag, potassium chlorid and sulphate, kainit, sodium nitrate, guano, ammonium sulphate, calcium cyanamid, lime, and the drainage from stable manure were added to water containing gudgeon in amounts approximating normal applications of these materials as fertilizers, the object being to determine the possible injury to fish from application of fertilizers to soils draining into the ponds and streams in which the fish occur.

The results show that there is no reason to fear injury to fish life from normal applications of calcium nitrate, superphosphate, basic slag, potassium chlorid and sulphate, kainit, sodium nitrate, and guano. Injury was observed, however, in the case of applications of lime (except in small quantities), cyanamid, ammonium sulphate, and liquid manure, and it is believed that the application of these substances to land draining directly into small fish ponds and streams may be followed by harmful results.

The first five years' results of long-time continuous experiments with fertilizers, CLAUSEN (*Landk. Wehnbl. Schles. Holst.*, 63 (1913), No. 33, pp. 636-642, figs. 4).—The experiments were made on small plats of sandy and loam soils with potatoes in 1908, oats in 1909, buckwheat in 1910, rye in 1911, and potatoes in 1912.

The results indicated in general greater advantage from the use of fertilizers on sandy soils than on loam soils. The most uniformly and continuously effective fertilizer was a complete one. The results with incomplete fertilizers were irregular and not conclusive. The potash salts used seemed to be positively injurious to buckwheat.

Soil and fertility, A. WENZ (*Dakota Farmer*, 33 (1913), Nos. 10, pp. 619, 620; 11, pp. 659, 660, figs. 2; 12, pp. 695, 696; 13, pp. 727, 728; 14, p. 759; 15, p. 791; 16, p. 823; 17, pp. 856, 857).—The demonstration experiments with fertilizers made along the route of one of the railroads of the Northwest are critically reviewed.

The relation of fertilizer consumption to crop production, B. W. KILGORE (*Amer. Fert.*, 39 (1913), No. 8, pp. 54-60).—In this address special emphasis is laid upon the need of better adaptation of fertilizers to crops and soils as shown by carefully conducted experiments.

The future of the fertilizer industry in the United States, F. K. CAMERON (*Amer. Fert.*, 39 (1913), No. 8, pp. 66-68, fig. 1).—It is suggested in this paper that to successfully meet new conditions which are imminent in the fertilizer industry fertilizer manufacturers should provide for more technical assistance than they now command, "possibly by the foundation of a research laboratory" under their auspices and direction.

The commercial value of nitrogen, P. MESSIER (*Ann. Sci. Agron.*, 4. ser., 2 (1913), II, No. 2, pp. 138-141).—The bearing of solubility (and hence assimilability), character of associated substances, and certain secondary considerations, such as physical properties of the compounds, is briefly discussed.

The utilization of atmospheric nitrogen by natural and artificial means, F. MARSHALL (*Naturwissenschaften*, 1 (1913), Nos. 33, pp. 791-795; 34, pp. 805-809).—A technical review of the subject is given.

The industrial synthesis of nitric acid and ammonia, C. MATIGNON (*Rev. Sci. [Paris]*, 51 (1913), II, No. 16, pp. 481-493; *Rev. Gén. Chim.*, 16. (1913), Nos. 21, pp. 357-365; 22, pp. 381-388).—The progress which has been made, especially in France, in the industrial application of the various processes which have been proposed is reviewed.

The formation of aluminum nitrid from alumina, carbon, and nitrogen, W. FRAENKEL (*Ztschr. Elektrochem.*, 19 (1913), No. 8, pp. 362-373, figs. 4; *Monit. Sci.*, 5. ser., 3 (1913), II, No. 864, pp. 741-751; *Amer. Fert.*, 39 (1913), No. 9, pp. 25-33).—A study of the influence of various conditions of temperature, pressure, purity of materials, catalysts, etc., on the formation of aluminum nitrid is reported.

The fixation of air nitrogen by means of boron compounds, A. STÄHLER and J. J. ELBERT (*Ber. Deut. Chem. Gesell.*, 46 (1913), No. 10, pp. 2060-2077, figs. 6).—Studies of the reactions occurring with various boron compounds under high pressure are reported.

The fixation of nitrogen by mixtures of barium oxid and charcoal, T. EWAN and T. NAPIER (*Jour. Soc. Chem. Indus.*, 32 (1913), No. 9, pp. 467-474, figs. 3).—This article reports the results of experiments undertaken in 1909 "in order to find out whether, with the help of a suitable catalyst, it is possible to fix nitrogen by the barium process without resorting to the very high temperatures hitherto employed."

Tectonics of the potash deposits of Kalusz, eastern Galicia, F. KOSSMAT (*Jahrb. K. K. Geol. Reichsanst. [Austria]*, 43 (1913), No. 1, pp. 171-192, figs. 4).—The literature of the subject is noted and the origin and structure of these deposits are discussed.

Potash from silicates, F. FRIEDENSBURG (*Chem. Indus. [Berlin]*, 36 (1913), No. 15-16, pp. 467-470).—The commercial possibilities of various processes which have been proposed for recovering potash from silicates are briefly discussed.

White rock phosphates of Decatur County, Tennessee, T. P. MAYNARD (*Resources Tenn.*, 3 (1913), No. 3, pp. 161-169, figs. 2).—The white rock phosphates of this locality are found in 3 tracts, the Beech River, Rushing Creek, and Whites Creek. These deposits vary in physical and chemical properties and their physical character is a criterion of their chemical composition. The three principal types of ore present are (1) the lamellar phosphates, which immediately overlie the limestones; (2) the deposits associated with chert; and (3) the stony or siliceous phosphates, while in the Whites tract a pebble phosphate is found deposited along the river valley, except in case of the lamellar phosphate.

Chemical analyses of average samples taken from these three tracts showed a high content of silica and aluminum due to the adhering clay, making it necessary to wash the ore to procure a high grade of material for the manufacture of superphosphate. The content of iron oxid exceeded 2 per cent but never approached the prohibitive amount of 4 per cent. The deposits are found over an extensive area and can be located without much difficulty.

The discovery and opening of a new phosphate field in the United States, C. C. JONES (*Bul. Amer. Inst. Mining Engin.*, 1913, No. 82, pp. 2411-2435, figs. 13).—Early explorations by the author beginning in May, 1903, which it is claimed "demonstrated the existence of a very large phosphate field in the high intermountain country of northeastern Utah, southeastern Idaho, and western Wyoming," are described.

The composition of phosphatic slag as regards phosphoric acid and lime content, E. ROUSSEAUX and G. JORET (*Bul. Mens. Off. Renseig. Agr. [Paris]*, 12

(1913), No. 8, pp. 957-959; *Jour. Agr. Prat., n. ser.*, 26 (1913), No. 32, pp. 175, 176).—Analyses are reported which show that there is no relation between lime and phosphorus in basic slag, i. e., that a slag low in phosphorus is not necessarily high in lime, and vice versa.

The valuation of basic slag, D. R. EDWARDES-KER (*Jour. Southeast. Agr. Col. Wye*, 1912, No. 21, pp. 296-301).—It is proposed that the valuation be based on both the total and the citric acid soluble phosphate and not on the latter alone as at present; "that a value of, say 9 d. [18 cts.] per unit of phosphate of lime be given to the percentage of insoluble phosphate (i. e., the difference between the total phosphate and the citric soluble), a proportionately lower value than that usually adopted being taken for the unit of citric soluble phosphate, say 1 s. 7 d. [38 cts.]."

The action of lime in Thomas slag (*Chem. Ztg.*, 37 (1913), No. 92, pp. 925, 926).—Investigations are briefly referred to which indicate that the lime of Thomas slag is very effective in soil requiring lime.

Calcium fluosilicate as a new lime fertilizer or amendment, U. ALVISI (*Rend. Soc. Chim. Ital.*, 2. ser., 4 (1912), No. 11, pp. 293, 294).—Good results with this material as a fertilizer for grain are reported.

Injurious effect of heavy applications of lime on upland moor soils, A. DENSCH (*Landw. Jahrb.*, 44 (1913), No. 1-2, pp. 331-352; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 39 (1913), No. 4-7, pp. 159, 160).—Large applications of lime on such soils resulted in a partial reduction of nitrates to ammonia and in the production of nitrites which persist for a considerable time in the soil. This causes not only loss of nitrogen but also direct injury to plants. In connection with the nitrites nitro and nitroso compounds are also formed which are injurious to plant growth.

Chemical causes and character of the injurious effect of large amounts of lime on peat soil, G. A. RITTER (*Fühling's Landw. Ztg.*, 61 (1912), No. 18, pp. 593-604; *abs. in Zentbl. Agr. Chem.*, 42 (1913), No. 4, pp. 239-242; *Jour. Chem. Soc. [London]*, 104 (1913), No. 609, I, p. 812; *Centbl. Bakt. [etc.]*, 2. Abt., 39 (1913), No. 4-7, pp. 158, 159).—The injurious effects of heavy liming on moor soils are thought to be due to purely chemical causes, viz, to the formation of poisonous oxidation products of humus.

The chemical composition of garbage and street sweepings of Montevideo, J. SCHRÖDER (*Rev. Inst. Agron. Montevideo*, 1913, No. 12, pp. 20-22).—Analyses of several samples are reported.

Analyses of registered fertilizers, J. T. WILLARD, C. O. SWANSON, and R. C. WILEY (*Kansas Sta. Bul.* 187, pp. 71-81).—Analyses and guaranteed composition of fertilizers inspected under the State law are reported with a statement of receipts and disbursements, lists of dealers, and a schedule of trade values of fertilizing materials. As a rule the composition of the fertilizers was found to be "within the limits of tolerance provided by the law which permits a deficiency of not more than 1/15 of the guaranteed percentage without such deficiency being taken as evidence of fraudulent intent."

Analyses of commercial fertilizers, J. H. KASTLE and H. E. CURTIS (*Kentucky Sta. Bul.* 168, pp. 387-525).—Analyses of 672 brands of fertilizers registered for sale in Kentucky during the year 1912 are reported. The results showed that in most cases the fertilizers came fully up to their guaranties.

Analyses of commercial fertilizers, B. L. HARTWELL ET AL. (*Rhode Island Sta. Insp. Bul.*, 1913, Sept., pp. 2-8).—Analyses and valuations of fertilizers inspected to date under the State law are reported.

AGRICULTURAL BOTANY.

Methods for bacteriological examination of soils, P. E. BROWN (*Iowa Sta. Research Bul. 11, pp. 381-407; Centbl. Bakt. [etc.], 2. Abt., 39 (1913), No. 1-3, pp. 61-73*).—In this paper the author reviews the methods that have been suggested for the bacteriological examination of soils, and gives the results of studies on different media for the quantitative determination of bacteria in soils.

In the bacteriological examination of soils various objectionable features have been found in the different methods, and the author reports studies to determine their relative efficiency. According to the author, fresh soil is the most rational medium for studying the physiological activities of soil bacteria. An albumin solution may serve as a measure of ammonification and is preferable to dried blood, but it possesses the disadvantage that it is very difficult to prepare. A solution of casein proved quite satisfactory as a measure of ammonification and did not possess any of the disadvantages of the other nitrogenous materials. Slight variations in moisture conditions in field soils did not appear to affect materially the ammonification of casein. Ten cc. of a 10 per cent solution of casein was found to be the best amount to use for 100 gm. of fresh soil, and the optimum incubation period at room temperature was found to be 3 days.

In studying the media for the quantitative determination of bacteria in soils the author found that albumin agar permitted the development of much larger numbers of bacteria than the modified synthetic agar or any other medium tested, except an artificial humus agar. Casein agar permitted the development of bacteria, but in smaller numbers than the albumin agar. An artificial humus agar yielded practically the same counts as were obtained with albumin agar. The difficulties in the preparation of this material and the fact that it is not in any way superior to albumin agar led to the recommendation that the latter medium be employed. Media prepared from soil extracts permitted fewer organisms to develop than the modified synthetic agar.

A new method for the bacteriological examination of soils, P. E. BROWN (*Science, n. ser., 38 (1913), No. 977, p. 413*).—This is an abstract of a paper presented before the Society of American Bacteriologists.

"The method recommended consists in testing of fresh soil obtained as described in previous work by the author [*E. S. R.*, 26, p. 428], adding a solution of casein for ammonification, ammonium sulphate for nitrification, and mannite for nitrogen fixation."

Nitrogen collecting bacteria, fallow, and exhaustive culture, T. PFEIFFER (*Stickstoffsammelnde Bakterien, Brache und Raubbau. Berlin, 1912, 2. ed., rev. and enl., pp. 100*).—This is a second enlarged and amended edition of the work previously noted (*E. S. R.*, 16, p. 858).

Can fungi living in agricultural soil assimilate free nitrogen? H. N. GODDARD (*Bot. Gaz., 56 (1913), No. 4, pp. 249-305, figs. 18*).—The investigation described in this paper was begun to determine what species of fungi live habitually in ordinary agricultural soil, to study their distribution as to the depth and nature of the soil, and to ascertain the part they play in soil fertility. About 17 species were isolated and studied when attention was turned to the subject of nitrogen-fixing power.

Summarizing his results, the author states that many species of fungi live habitually in the soil, some of them not thus far having been found elsewhere. These appear rather uniformly distributed at different depths, at least as low as 14 cm. Tillage and manuring, so far as observed, seem to produce little change in the number or kind of fungi present. It was found that the fungi could be readily cultivated and isolated, and of the forms studied, including at

least 14 species, none of them showed any power of assimilating free nitrogen when grown in nitrogen-free media under the conditions of the experiment. The species of *Myceliophthora* and probably of *Fusarium* also showed no power of assimilating free nitrogen even when grown in nitrogen-containing media. *Myceliophthora* when grown in a nitrogen-containing solution assimilated different proportions of nitrogen, depending on the concentration of the nitrogen compound. The amount of combined nitrogen taken up from the air by cultures standing exposed did not seem to be sufficient to make any appreciable difference in their nitrogen content, either when in nitrogen-free or in nitrogen-containing media. The fungi studied did not seem to be able to use nitrogen in all its forms. The Kjeldahl method of analysis was found to be capable of a degree of accuracy which reduced the limit of error to very nearly 0.1 mg. for each determination where small quantities of nitrogen were used, and 0.3 mg. where larger quantities were employed. A very perceptible growth of mycelium was possible in practically nitrogen-free media, but in such cases the nitrogen content was found by analysis to fall within the limit of error of the method. In addition the mycelium showed a starved, shriveled condition, as if deficient in some necessary element. In these cases mycelia having a dry weight of 3 to 6 mg. gave amounts of nitrogen within the limit of error. Conversely, where the dry weight of mycelium was not more than 6 to 8 mg., this weight could probably be taken as an index of little or no nitrogen fixation.

A bibliography of the subject is appended.

Sporulation in *Aspergillus niger* and *A. fumigatus*, B. SAUTON (*Compt. Rend. Soc. Biol. [Paris]*, 74 (1913), No. 6, pp. 263-265).—Experiments were made to ascertain whether certain small proportions of phosphorus or magnesium permit even weak development of mycelium without sporulation as in the case of potassium, iron, manganese, and sulphur (*E. S. R.*, 29, p. 30).

The author employed as nutritive medium Raulin's solution, except that phosphorus and magnesium were present in very small quantities as regards one or both. It was found that sporulation of both the fungi was increased by decreasing the proportions of both phosphorus and magnesium. In the case, however, of magnesium, as of sulphur, iron, etc., a very small proportion gave no sporulation. Attempts to substitute glucinium for magnesium in Raulin's fluid, suggested by the analogy presented by these metals, gave negative results with both of these fungi. Phosphorus seems absolutely indispensable to both fructification and growth. In very weak solutions, mycelial growth is very slight, but sporulation is very rapid, distinguishing phosphorus from other elements investigated in this respect. It is claimed that all constituents of Raulin's liquid have been shown to participate in spore formation with the possible exception of zinc.

The water requirements of plants, L. J. BRIGGS and H. L. SHANTZ (*U. S. Dept. Agr., Bur. Plant. Indus. Buls.* 284, pp. 49, pls. 11, figs. 2; 285, pp. 96, figs. 6).—This consists of 2 parts.

I. *Investigations in the Great Plains in 1910 and 1911.*—This bulletin gives the results of pot and field investigations carried on with a number of field crops and indigenous plants to determine their water requirements under the conditions occurring in the Great Plains.

The experiments were conducted at Akron, Colo., and at Amarillo and Dalhart, Tex. By the term water requirement the authors indicate the ratio of the weight of water absorbed by a plant during its growth to the weight of dry matter produced. In the pot experiments large pots were used and so protected that the loss of water was limited to that occurring from the transpiration of the plants.

The average amounts of water required to make 1 lb. of dry matter and 1 lb. of grain for the different crops at Akron, Colo., in 1911 were as follows:

Water requirement of crops grown at Akron, Colo., in 1911.

Crop.	Dry matter.	Grain production.	Crop.	Dry matter.	Grain production.
	<i>Pounds.</i>	<i>Pounds.</i>		<i>Pounds.</i>	<i>Pounds.</i>
Alfalfa.....	1,068		Wheat.....	507	1,357
Field peas.....	800	2,218	Potato.....	448	
Artemisia.....	765		Rape.....	441	
Spring rye.....	724	2,215	Sugar beet.....	377	
Sweet clover.....	709		Corn.....	369	
Oats.....	614	1,680	Weeds.....	322	
Buckwheat.....	578	1,037	Sorghum.....	306	790
Barley.....	539	1,241	Millet.....	275	923

The determinations made in the different years and at the different localities showed some fluctuation, which would be expected from the differences in evaporation from free water surfaces.

II. *A review of the literature.*—The authors here give a summary of investigations bearing upon the subject, reviewing the papers with reference to the various factors which affect water requirement. A bibliography is appended.

Summer evaporation intensity as a determining factor in the distribution of vegetation in Connecticut, G. E. NICHOLS (*Bot. Gaz.*, 56 (1913), No. 2, pp. 143-152).—During the summer of 1912 continuous evaporation records were taken at numerous localities in the State by means of porous clay atmometers. It was found that the period of maximum evaporation coincides approximately with the more critical period of vegetative activity. It appears also that the area dominated largely by the mesophytic northern hard wood type of forest and the strip along the east coast constitute regions of relatively low evaporation intensity, and that the rate of evaporation in the eastern highland, where oaks predominate in the forest, is somewhat higher than in the central lowland, where the more mesophytic chestnut is the characteristic tree. Attention is called in this connection to the more maritime climate of the eastern portion of Connecticut beyond Long Island.

Calcareous chlorosis of green plants: The rôle of root excretions in the absorption of iron in calcareous soils, P. MAZÉ, M. RUOT, and M. LEMOIGNE (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 12, pp. 495-498).—In continuation of previous investigations (E. S. R., 28, p. 242), the authors report on the effect of a lack of iron on chlorosis.

Vetches and peas were grown in nutrient solutions, and when 2 per cent calcium carbonate was added chlorosis immediately appeared, although iron sulphate was present in all the solutions. A few drops of iron nitrate in the solution caused the return of the green color to the plants. The addition of organic acids that are capable of dissolving iron in the presence of calcium carbonate had the same effect within a few days. In some of the solutions the plants became chlorotic even when there was originally no calcium carbonate present. This is explained by the absorption of other calcium salts by the roots and the excretion of calcium carbonate from them. The difference observed in plants regarding their resistance to chlorosis is said to depend in part at least on the acidity of the cell sap.

In treating plants for chlorosis iron nitrate has given good results when a 0.2 per cent solution was sprayed on the leaves. For leguminous plants iron sulphate is said to be preferred, as it furnishes sulphur, the lack of which is also said to cause chlorosis.

The formation of anthocyanin in mitochondria, M. GUILLIERMOND (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 25, pp. 1924-1926).—As the result of studies on buds of the walnut and rose, the author claims to have shown that a close relation exists between anthocyanin and tannin in these plants, the mitochondria being intimately concerned with the origin of both as of chlorophyll, xanthophyll, and carotin. This is in accordance with views held by V. Grafe (*E. S. R.*, 27, p. 228) and others, to the effect that anthocyanin is not the result of oxidation of glucosids preexistent in the cellule, but that it is formed in place, so to speak, as the result of mitochondrial activity.

Experiments on the availability of glucosamin hydrochlorid as a source of nitrogen for the nutrition of corn and beans, M. L. HAMLIN (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 8, pp. 1046-1049, fig. 1).—"Two sets of experiments were carried out; in the first corn and beans were used, and in the second only beans. In each set one series of plants was grown in one of the usual culture solutions, a second series in a solution containing no nitrogen, and a third series in a solution containing glucosamin hydrochlorid as the sole source of nitrogen. In the second set, beans were grown in solutions containing different concentrations of glucosamin. No attempt was made to grow the plants under bacteriologically sterile conditions.

"In every case glucosamin had directly or indirectly a very deleterious effect and caused a speedy withering . . . From the . . . experiments it is evident that under the conditions of growth glucosamin could not be utilized as a source of nitrogen for nutrition, owing either directly to its own characteristics, or indirectly to conditions it may have caused, such as the growth of some mold."

Variations of carbohydrates in the development of leaves, E. M. DURAND (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 25, pp. 1926-1929).—The tabulated results of a study at 4 stages of *Fagus sylvatica*, *Ampelopsis hederacea*, and *Betula alba* in regard to the weights of the various forms and the total of carbohydrates in the leaves are cited to show that toward the end of the vegetative period there is a general diminution of carbohydrates following a maximum reached in August or September. The maximum of reducing sugars is attained at or just before the reddening or yellowing of the vegetation, after which these rapidly disappear. Starch, when present, gradually diminishes from its maximum to zero in the leaves while these are still green. Amyloids reach their maximum in the green leaves of *Ampelopsis*, but in yellowed leaves of *Betula*. Celluloses, which diminish steadily in *Ampelopsis*, increase continually in *Betula*. The diminution of the principal carbohydrates continues in all detached leaves, but is most rapid in those exposed to rain. The greater portion, but not all, of the carbohydrates that disappear toward the close of the vegetative period go to the trunk, the change to soluble forms of carbohydrates being favored by the occurrence of cold weather.

Quantitative experiments on the effect of formaldehyde on living plants, SARAH M. BAKER (*Ann. Bot. [London]*, 27 (1913), No. 107, pp. 411-442, pls. 2, figs. 4).—The author describes experiments in which plantlets were grown in atmosphere containing known quantities of formaldehyde vapor in light or in darkness. It is said to have been found that formaldehyde can be used for the synthesis of food materials to some extent (not equally well at all concentrations) in light. In darkness it seemed to stimulate respiration, but an excess produced a toxic effect more marked than in light. Acetic aldehyde was not utilized. Formaldehyde, it is thought, may function as a stage in photosynthesis, light energy being required for its utilization.

The power of growth in plants, G. E. STONE (*Pop. Sci. Mo.*, 83 (1913), No. 3, pp. 231-239, figs. 10).—The author has described a number of very striking

examples of the force exerted during the growth of certain plants as reported by various investigators.

On the germination of the seeds of some dicotyledons, J. ADAMS (*Sci. Proc. Roy. Dublin Soc., n. ser., 13 (1913), No. 33, pp. 467-499, pl. 1*).—The author states that "one of the objects of the present investigation was to discover how long the seeds of a particular species lie dormant in the ground before germination Another . . . was to obtain specimens of the seedlings Altogether observations were made on 278 species belonging to 190 genera and 58 families of dicotyledons." Alphabetical lists are given of the families, genera, and species employed, nearly all of which were natives of the British Isles. Lists are also given of plants the seeds of which germinate the same year they are produced, of those having subterranean cotyledons, and of species showing irregularity in the number of their cotyledons.

The largest percentage of seeds almost impervious to water, hence refusing to germinate for a long time (without artificial thinning of the seed coat by means of acids, etc.), was obtained from *Vicia sepium*. It is stated that the seeds of stone fruits do not usually germinate until the hard protective covering has decayed in the soil, by which time the embryo has had time to mature fully.

Germination of seeds after chemical treatment and exposure to light, F. SIMON (*Biochem. Ztschr., 48 (1913), No. 5, pp. 410-417; abs. in Jour. Chem. Soc. [London], 104 (1913), No. 606, I, p. 431*).—The author gives in tabular form the results obtained by treating seeds of cress, lettuce, oats, and radish with ferrous or ferric sulphate or with uranyl sulphate, the seeds being subsequently kept in light or in darkness for five days. While after treatment differences as regards percentage of germination appear in case of particular species, these were generally either small or contradictory when all the forms examined are considered, so that no statement of general application is made in regard to the hastening or retarding effect of the chemical treatment.

Some observations concerning the reactions of the leaf hairs of *Salvinia natans*, F. M. ANDREWS and M. M. ELLIS (*Bul. Torrey Bot. Club, 40 (1913), No. 8, pp. 441-445*).—Experiments were carried out to determine whether this plant may be able to absorb food from fresh or decaying animal matter or other nutritive substance placed on the leaves. Tests were made with various animal substances, a nutrient solution, and cinders and iron filings placed in contact with the leaf hairs.

"One of the most interesting results was the chemotactic reaction of the leaf hairs The experiment proved that the leaf hairs are capable of exerting a distinct solvent action on the organic matter placed on them."

Osmotic pressure in plants.—I, Methods of extracting sap from plant organs. II, Cryoscopic and conductivity measurements on some vegetable saps, H. H. DIXON and W. R. G. ATKINS (*Sci. Proc. Roy. Dublin Soc., n. ser., 13 (1913), Nos. 28, pp. 422-433; 29, pp. 434-440*).—The authors claim that the sap pressed from living, untreated tissues does not give a true estimate of the concentration of that in the vacuoles of the cells of the organ before the application of pressure, and that in order to extract the sap from the cells without altering its concentration, it is necessary to render the protoplasmic membrane permeable. This, it is claimed, may be effected by employment of liquid air. Discovery of this fact is held to require the correction of certain results previously obtained by the authors (*E. S. R., 27, p. 631*), and some of the corrected data are given in the present papers in tabular form. It is claimed that the figures previously published were really too low, and that the actual osmotic pressures in the cells are much greater than is required by the cohesion theory of sap ascent, as upheld by Dixon (*E. S. R., 15, p. 123*).

The physiology of the pollen of *Trifolium pratense*, J. N. MARTIN (*Bot. Gaz.*, 56 (1913), No. 2, pp. 112-126, fig. 1).—The author states that "the investigation of red clover pollen was begun with the hope that a thorough knowledge of its physiology, in conjunction with the history of the embryo sac, might help to overcome the uncertainty of clover seed production. . . The work has to do with three questions: Conditions necessary for the germination of pollen; the stigma as a stimulative and directive factor in tube development; and relative potency of the pollen in self and cross-pollination." The following conclusions are reached:

"The pollen of *T. pratense* is physiologically different from that of *T. hybridum* and *T. repens* in respect to behavior toward sugar solutions. The only function of the sugar solution in the case of the pollen of *T. hybridum* is the controlling of water supply. The germination of the pollen of *T. pratense* is delicately adjusted to water absorption. The results of the investigation show that the stigma produces no secretions which influence pollen tubes. The nature of the pollen demands no other function of the stigma in its germination than the control of the water supply. The pollen in self-pollination germinates readily on the stigma, but the tubes traverse the style much more slowly than in cross-pollination."

A bibliography is given.

On the relationship between the number of ovules formed and the capacity of the ovary for maturing its ovules into seeds, J. A. HARRIS (*Bul. Torrey Bot. Club*, 40 (1913), No. 8, pp. 447-455, figs. 2).—The author's investigations have consisted chiefly in determining the correlations between the degree of development of various somatic organs and the fertility of the fruit, the problem being to determine whether ovaries with a number of ovules above the average are more (or less) capable of developing their ovules into seeds than those below the average.

From the tabulated and graphically represented results obtained from studies carried out, he concludes that in dwarf varieties of garden beans there is but a slight relationship between the number of ovules per ovary and its capacity for maturing these ovules into seeds, although such a relationship is said to exist. So far as the materials available may be considered as representative of the species it is generally negative, i. e., as the number of ovules formed increases the capacity for maturing these ovules into seeds decreases.

Bud variations in *Solanum*, E. HECKEL and C. VERNE (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 12, pp. 484-487).—In continuation of a previous communication (*E. S. R.*, 28, p. 530), the authors give an account of their studies on the possibility of inducing mutation in a number of species of *Solanum*. By means of the excessive use of fertilizers, particularly those having a high nitrogen content, mutation has been observed in the tubers of 5 species, *S. commersonii*, *S. maglia*, *S. tuberosum*, *S. immite*, and *S. jamesii*.

FIELD CROPS.

[Fertilizer experiments with field crops], A. W. K. DEJONG (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Agr. Chem. Lab.*, 1912, No. 1, pp. 40, pl. 1, figs. 2).—In fertilizer experiments with maize from 28 to 30 per cent better results were obtained with superphosphate than with bone meal, guano, and Thomas slag, bone meal ranking second. The results with sodium nitrate were better than with calcium nitrate or sulphate of ammonia. In a fertilizer experiment with cassava the largest increase in yield of roots was with calcium nitrate, in comparison with sulphate of potash, Thomas slag, or combinations of these. With cowpeas the largest yield of grain was with superphosphate,

with sulphate of potash second. Soy beans produced better with barnyard manure, superphosphate, and potassium chlorid, being closely followed by those with potassium chlorid and barnyard manure. Barnyard manure alone apparently gave better results than either chemical alone, or barnyard manure and superphosphate.

New publications on the subject of plant breeding (*Ztschr. Pflanzenzücht.*, 1 (1913), No. 2, pp. 223-256).—Abstracts of about 50 articles and books recently published are presented.

Sixth and seventh annual report of the Minnesota Field Crop Breeders' Association, compiled by C. P. BULL (*Ann. Rpt. Minn. Field Crop Breeders' Assoc.*, 6-7 (1909-10), pp. 139, figs. 18).—This report gives the constitution and by-laws of the Minnesota Field Crop Breeders' Association and the minutes of the sixth and seventh meetings of the association, also addresses on corn, potato, and oat culture, Hubbard squash breeding and marketing, crop rotation, and the origin of Minnesota soils.

Annual report upon the agricultural department, W. H. JOHNSON (*Ann. Rpt. Agr. Dept. South. Nigeria*, 1911, pp. 19).—This report gives results of field tests of maize, cassava, cowpeas, guinea corn, ere beans, and cotton, in which the cotton yielded from 273.7 to 369.3 lbs. seed cotton per acre.

Annual report of the department of agriculture, Bombay Presidency, W. W. SMART (*Ann. Rpt. Dept. Agr. Bombay*, 1911-12, pp. 78).—In this report are given some results of experiments with rice, cotton, sugar cane, peanuts, clover, and alfalfa, in which an imported variety of cotton, Cambodia (102 E), produced better than the local varieties, yielding 410.5 lbs. seed cotton per acre and giving about 38 per cent lint, or 8 per cent more than the local varieties.

Annual report of the Cuttack Agricultural Station, 1911-12, G. SHERRARD (*Ann. Rpt. Cuttack Agr. Sta. [Bengal]*, 1911-12, pp. 12).—This report contains tabulated results of manurial, variety, seeding, rotation, and plowing experiments with rice; rotation and manurial experiments with jute; and variety tests and manurial experiments with sugar cane.

Report of the agricultural department, Assam, J. McSWINEY (*Rpt. Agr. Dept. Assam*, 1912, pp. 15).—Reports of experiments with green manure crops, fodder crops, potatoes, and sugar cane are given. It is noted that a Barbados variety of cane produced 3.7 tons of cane sugar per acre.

Bermuda [grass], O. O. CHURCHILL (*Oklahoma Sta. Circ. Inform.* 16, pp. 4, fig. 1).—This circular comprises directions for planting and growing Bermuda grass.

The Mendelian chemical characters in maize, R. PEARL and J. BAETLETT (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 6 (1911), No. 1-2, pp. 1-28, fig. 1; *abs. in Zentbl. Agr. Chem.*, 41 (1912), No. 6, pp. 396, 397).—Wide variations in the content of protein, fat, ash, sugar, crude fiber, and starch in the kernel were observed which the authors ascribe to segregation.

Corn culture, W. G. DEARING (*Louisville, Ky.*, 1913, pp. 105).—This book purports to be a conversation between a farmer and his trader friend, in which the former explains the scientific principles involved in the production of his 100 bu. of corn per acre, including the subjects of drainage, green manuring, crop rotation, plant nutrition, and fertilization.

Field trials with varieties of mangels, E. E. STOKES (*Midland Agr. and Dairy Col. Bul.* 3, 1912-13, pp. 19-30).—The yields in this test of 8 varieties ranged from 16 tons 11½ cwt. to 22 tons 13½ cwt. per acre.

Results of field trials on top-dressings for mangels, 1912, F. WAKERLEY and E. E. STOKES (*Midland Agr. and Dairy Col. Bul.* 4, 1912-13, pp. 31-37).—In these trials the nitrates of soda, lime, and ammonia were used as top-dress-

ings, the indications from the first year's results favoring the nitrate of ammonia.

Oats: Experiments on culture, varieties, and fertilization, J. F. DUGGAR and E. F. CAUTHEN (*Alabama Col. Sta. Bul. 173, pp. 121-144, figs. 4*).—Experiments on methods of sowing oats included sowing broadcast, with a grain drill, and drilling in open furrow, and the results for several years show that drilling with the ordinary grain drill gave most satisfactory results, although all thorough methods were satisfactory when the winters were not severe.

The advantages of fall over spring sowing were pointed out to be "(1) a much larger yield, even after deducting the losses from partial winter killing; (2) the utilization of poorer land by the fall-sown crop; (3) the employment of teams at a time when they are not needed in preparation of land for cotton or corn; and (4) earlier maturity of fall-sown oats, permitting the use of the crop and the use of the land at least 2 weeks earlier than when oats are sown after Christmas." Fall seeding gave an average increase of 19.6 bu. per acre over spring seeding.

Tests of varieties ranging from 3 to 10 years showed yields varying from 2.5 to 61.5 bu. per acre. The Red Rust Proof type proved to be the best yielder, with Applier at the head in a 9 years' test, followed by Red Rust Proof in a 10 years' test. Six varieties of oats are described.

In fertilizer trials nitrate of soda, cotton-seed meal, cotton seed, sulphate of ammonia, calcium cyanamid, ground rock, acid phosphate, and barnyard manure were used, and resulted in the following conclusions: "The yield of oats has been profitably increased by nitrogen in almost every form in which it has been tested . . . Of the commercial sources of nitrogen the most effective has been nitrate of soda . . . Acid phosphate proved more effective and economical for oats than did ground-rock phosphate. A general fertilizer for oats may well consist of 200 to 300 lbs. of acid phosphate per acre, and on poor, sandy land 30 lbs. of muriate of potash (or equivalent), all applied at the time of planting; and, in addition, 100 lbs. of nitrate of soda in March. However, in a permanent system of farming most of the nitrogen for oats should be supplied by a preceding crop of legumes, or in the form of stable manure."

Oat smut is discussed and directions for treatment are given.

Three and four-year oat experiments, W. OHLMER (*Arch. Deut. Landw. Gesell., 1912, No. 215, pp. 734*).—This reports results of numerous experiments carried out under the direction of the German Agricultural Society. Two series of experiments are discussed, one covering the period from 1905-1907, and the other from 1905-1908.

The 3 standard varieties gave average yields of grain ranging in 1905 from 2,348 to 2,400 kg.; in 1906 from 2,742 to 2,967 kg.; and in 1907 from 3,140 to 3,440 kg. per hectare. The average annual yields of grain for the second series ranged from 1,947 kg. per hectare in 1905 to 2,945 kg. in 1907. Each experiment is discussed, and the results tabulated in detail, giving yield of grain and straw; weight of 1,000 kernels, which ranged from 28.89 to 37.20 gm.; weight of 1 liter of kernels, which ranged from 485.3 to 553 gm.; the percentage of hulls to grain weight, which was from 21.32 to 29; and the content of ash, protein, fat, fiber, and nitrogen-free extract.

An anatomical investigation of some oat families, with reference to the relation between the anatomical structure and the physiological characters of plants, O. W. JAKUSHKINE and N. WAWILOV (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 6, pp. 830-861*).—This paper reports work on 17 varieties of oats planted in the experiment fields at Moscow in 1911-12. A description of these varieties is given. The investigation was confined to the

measurements of the stomata found near the center of the leaves, 50 from each variety. The average lengths for 1911 were 0.063 mm., and for 1912, 0.0735 mm., classed as large celled, while small celled ones averaged 0.054 mm. in 1911 and 0.067 mm. in 1912. There was found to be no relation between length of stomata and leaf surface.

The authors confirmed the work of other investigators that the higher the leaf on the stalk and the greater its distance from the root system the greater was the number of stomata per unit of surface, with a consequent decrease in the size of the stomata. The number of stomata on the upper surface of oats, as well as of wheat, was found to be greater than on the lower surface. There seemed to be no correlation between the size of the stomata and the vegetative period, the tillering ability, rust resistance, or productivity of the oat plant.

The inheritance of certain characters in beets and turnips: I, Beets, B. KAJANUS (*Ztschr. Pflanzenzucht.*, 1 (1913), No. 2, pp. 125-186, pls. 6).—In this article the author discusses more fully work done since 1907 along this line, which has been previously mentioned (E. S. R., 27, pp. 33, 533). To this is added the results of 1912 in further studying the behavior of form and color characters in the genus *Beta*.

Conclusions are drawn from observations of various generations of crosses, in which the numerous forms and colors found and explained by presenting as alternatives 2 theories, one that there are present a great number of genetic factors which work together in different ways, and the other that there are a great number of factors which are very changeable. It is noted that with *Beta*, through continued selection of the segregated types which to a considerable degree are stable, all types may be developed from any one type. Repeated isolations of the individuals seemed to weaken the germ and seed-bearing ability of the plant. Constancy in type seemed to be reached most readily when selection was coupled with cross-fertilization of similar plants, as by isolation the form characters appeared to segregate rapidly in the offspring. The number and size of the leaves seemed to be correlative with structure of the root, and the degree of their red or yellow color corresponded to that of the root.

On the relation between the sugar content of the root and the chemical characters of the descendants of a mother beet in the first generation, K. ANDRĚJ and J. URBAN (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 25 (1912), Sects. I-Ve, App., pp. 511, 512).—The average sugar content decreased according to the average decrease in dry matter, and conversely, both with the roots and with the leaves. A slight increase in the ash content of the roots corresponded to an increased sugar content, while this relation was more marked with the ash of the leaves, and vice versa. An increase in the sugar content of the roots showed a corresponding or slightly greater increase in the nitrogen of the roots and leaves.

Variability in the appropriation of nitrogen by the descendants of a seed-bearing beet in the first generation, K. ANDRĚJ and J. URBAN (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 25 (1912), Sects. I-Ve, App., p. 513).—This paper notes that the range of variability in the appropriation of nitrogen of individuals in the same line was as high as 202.6 per cent of the general average in that line, which amounted to 1.98 gm. per plant. The quantity of sugar carried by the roots of the line studied showed equally wide variation. The proportion of nitrogen appropriated to 100 parts sugar varied greatly between the individuals, the range reaching 81.8 per cent of the general average, which in this generation was 3.67 parts in 100 parts of sugar per plant. The individuals richest in sugar appropriated on the average less nitrogen, and vice versa.

Variability in the chemical composition of the descendants of a seed-bearing beet in the first generation, K. ANDRLÍK and J. URBAN (*Orig. Commun. S. Internat. Cong. Appl. Chem. [Washington and New York], 25 (1912), Sects. I-Ve, App., pp. 515, 516*).—In the study of 100 individuals it is noted that the range of variation in the nitrogen content of the roots equaled 88.2 per cent of the average for this character (0.248 per cent), and in the leaves equaled 67.1 per cent of their average nitrogen content (0.325 per cent).

In the dry matter of the roots it reached 33.4 per cent of the mean of this character (23.56 per cent), and in the leaves 71.9 per cent of the mean (13.78 per cent). In the ash content of the roots it was 64.7 per cent of the average (0.692 per cent), and in the leaves 81.8 per cent of the average (3.25 per cent). The variations in weight of the leaves during the vegetative period equaled 189 per cent of their average weight (357 gm.), and those of the roots 183 per cent of the average (331 gm.). The range in variation of sugar content reached 28.5 per cent of the mean of the descendants examined (16.3 per cent).

The cultivation of cane and the sugar industry, J. B. SOBRINHO (*A Lavoura da Cana-da Industria Assucareira. Sao Paulo: Sec. Agr., 1912, pp. 127, figs. 92*).—This report presents the status of the sugar-cane industry of Brazil and describes the methods of cultivation and manufacture.

Sugar cane and sirup making, A. P. SPENCER (*Florida Sta. Bul. 118, pp. 51-67, figs. 7*).—This bulletin consists of recommendations and directions for growing sugar cane and for the production of sirup. The topics treated include soil, rotation, fertilizers, planting, cultivation, harvesting, seed cane, laying down the bed, stubble or ratoon cane, varieties, Japanese cane, cane grinding, evaporation of juice, fermentation in sirup, diseases of sugar cane by H. S. Fawcett, and insect enemies by J. R. Watson. A plan of a small sirup evaporator is included.

Results of field trials on the manuring of swedes, E. E. STOKES (*Midland Agr. and Dairy Col. Bul. 6, 1912-13, pp. 46-53*).—In these trials manurial applications of 150 lbs. sulphate of ammonia, 500 lbs. superphosphate, and 60 lbs. sulphate of potash were applied per acre. When nitrate of lime was used in place of sulphate of ammonia, slightly better returns were obtained, especially if the nitrate of lime was applied as a top-dressing. Wherever lime was used the cost of increase was greater than the increased return of crop.

The value of sweet clover, J. F. SINN (*Clarinda, Iowa, 1912, pp. 61*).—This book takes up the history of the plant and discusses the different species, the time of seeding, the preparation of soil and amount of seed to sow, including inoculation and fertilization, and the value of the plant as a hay crop, pasture, fertilizer, and seed crop.

Research into the variety classification of *Triticum vulgare*, F. MOEBIUS (*Landw. Jahrb., 43 (1913), No. 5, pp. 711-789, pls. 3*).—A careful study of the morphological characters of 415 heads of wheat, involving 20,000 kernels and 59 varieties, is reported, data being given on the thickness of the spikelet, length of the rachis, and weight and thickness of the kernel. From this data various correlations were computed between the length of spike and thickness of the spikelet, the thickness and weight of the kernel, and the spike form. The data are presented in tabular form from which a classification is made into 3 groups. Group 1 includes the thick spike variety (those over 30 mm.), group 2 medium varieties (between 20 and 29.9 mm.), and group 3 loose spiked varieties (under 20 mm.). Each group is subdivided into club form and nonclub form with another subdivision into white and red glume.

A report of the investigations concerning the chemical composition of wheat, 1906 to 1912, inclusive, R. W. THATCHER (*Washington Sta. Bul. 111*,

pp. 79, pl. 1).—This bulletin gives results of a study of environmental influences upon the chemical composition of wheat and of line-selection breeding for variation of nitrogen content of wheat. A review of investigations concerning the composition of wheat is also given.

From results of a previous study of the relation of climate to the composition of wheat (E. S. R., 26, p. 738) the author was led to conclude "that the climate, as the determining influence upon the length of the development period of the wheat kernel, was the chief factor in fixing the composition of the crop of any given season or locality." In further studying the effect of different factors of climatic and soil environment, acting singly or in combination upon the composition of wheat, it was found that by growing wheat under the same climatic conditions, but in different soils, the differences in composition of the original seed could not have been due to differences in the soil composition; nor was there any relationship between the protein content of the resultant crops and the composition of the soil upon which they grew.

Under conditions of uniform soil, growing season, distribution of annual rainfall, elevation, etc., with the total annual rainfall the only variable factor, the average protein content of wheat varied for the various counties inversely with the total rainfall received; and figures compiled from the principal wheat districts of the United States, including irrigated districts of Utah, indicated "that the moisture supply is a very potent factor in determining the composition of the wheat grown in any given locality or season."

In studying the influences of sunlight, wheats grown in cloudy weather, under cloth of varying density, and in sunshine were analyzed. These results showed that "shading, whatever the texture used or the length of the shading period, caused an increase in the percentage of mineral and nitrogenous matter and decreased percentage of carbohydrates. The increase in other constituents is not directly proportional to the decrease in starch. Hence, we conclude that the changes produced by the exclusion of direct sunlight are not simply a deterrence of the elaboration of starch or carbohydrates, but that other physiological changes are induced by the shading, which are not yet understood."

With reference to the influence of the length of the growing season it was found that the results of fall and spring seeding of the same variety of wheat "indicate that the variations in composition of same variety when given a longer or shorter growing season are likely to be fully as great, or even greater than the differences in composition of fall or spring-sown grain of different varieties grown in the same locality." It also appeared from these results "that the differences in composition between fall-sown and spring-sown wheats are not due to actual differences in the habit of growth and development of the different varieties, so-called 'varietal characters,' but to the elongation or shortening of the growth period by the planting at different seasons of the year." Shortening the development period of grain, by harvesting it before it is quite ripe, apparently increased the proportion of protein in the wheat and of gluten in the flour.

It is noted that spring wheats in general are richer in protein than winter wheats, but that in 1909 the reverse was true due to a short period of hot, dry weather in the latter part of June, which ripened winter wheat rapidly, followed by an unusually cool damp period which ripened spring wheat slowly.

A study of the correlation of the number of days of kernel formation with the composition of the resulting grain showed that "the average weight of kernel varies directly with the length of development period; that the percentage of nitrogen in the grain varies inversely with the length of this period; and that the length of this period is the determining factor in the final composition of the grain."

Seed of the same varieties were grown in various localities, but the author concludes that "there is not the slightest evidence of any relation between the composition of the resultant grain and that of the original seed, either in the direction of a hereditary tendency to high or low protein content, or of a consistent effect of climatic conditions to which the seed grain may have been supposed to have become adapted in each case."

Investigations on line selection breeding for variation of nitrogen content of wheat are reviewed and discussed. Tables show the variability in nitrogen content of wheat from various localities, including wheat of different varieties, of different strains of a single variety, of different plants in the same row, of different spikes of the same plant, and of kernels from different parts of the same spike. In experiments in line selection breeding for change of nitrogen content of wheat, selections were made of kernels from the inner and outer rows of the same spike; of seed from different spikelets of the same spikes; of upper, middle, and lower spikes from the same plant; and of high- and low-nitrogen plants.

From his work along this line the author concludes "that high- or low-nitrogen content is not a property of wheat which can be 'fixed' by line selection. In other words, the chemical composition of wheat is entirely a matter of environmental influence, as shown in part 1 of this report, and not a hereditary character, which can be varied at will by the plant breeder.

"It is the writer's opinion that further attempts to improve the chemical composition of Washington wheats by line selection breeding would be absolutely useless. This conclusion is in harmony with the opinion of some students of genetics, that it is impossible to establish new strains, or varieties, of self-fertilizing plants, by selection alone; but that there must first be cross-fertilization, either between different plants of the same variety, or plants of different varieties, in order to establish a heterozygotic condition as the first basis for selection of new strains."

Tri-local soil exchange experiments with wheat, J. A. LeCLERC and P. A. YODER (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 26 (1912), Sects. VIa-XIb, App., pp. 137-150*).—These experiments were conducted with soils from College Park, Md., Hays, Kans., and Davis, Cal., and were carried on for 3 years in each of these localities with an exchange of soil to the depth of 3 ft. from each place.

With very few exceptions it was found that the wheats grown in one locality on soils obtained from different sources showed great similarity in composition, indicating that the soil plays only a minor part in affecting either the physical appearance or chemical composition of wheat. On the other hand, the wheats grown on the same soil but in a location with decidedly different climatic conditions varied greatly in composition.

Tabulated analyses of the wheats grown in the 3 localities are given.

Wheat culture on moor lands, W. FRECKMANN and SOBOTTA (*Landw. Jahrb., 43 (1913), No. 5, pp. 695-709*).—This paper reports results in top-dressing low moor lands with sand, clay, and a mixture of the two to a depth of 12 cm. (4.7 in.).

It was found that winter wheat responded to this method of soil treatment, while spring wheat was not especially benefited. A covering of clay, or at least sand containing clay, favored wheat growth better than pure sand. It is noted that care should be taken that the moor soil has reached a considerable degree of decomposition before a covering of clay is applied. Drainage to allow part of the water to leave the soil was important in all cases. Seeding not later than the end of September and careful hoeing of the crop are also

recommended as necessary. A thick-headed Swedish wheat seemed to give the best results on these moor soils.

Preparing land for wheat, L. E. CALL (*Kansas Sta. Bul.* 185, pp. 3-16, figs. 2).—This bulletin discusses the preparation of wheat land for Kansas conditions and reports results obtained with each of 16 methods.

Larger returns were obtained from wheat grown in rotation than with wheat grown continuously. The largest yield of wheat in rotation was 44.66 bu. per acre when the land was plowed 7 in. deep on July 15, and the smallest, 25.50 bu., when the land was plowed 3 in. deep on September 15. The corresponding yields with wheat grown continuously were 34.95 and 16.39 bu.

Summer fallow proved to be the best method at the Fort Hays substation, giving an average yield of 21.1 bu. per acre in 4 years, as compared with 5.8 bu. with late fall plowing and 11 bu. with early fall plowing. Data are given in tabulated form.

New method of detecting vitality of seeds, S. TASHIRO (*Orig. Commun.* 8. *Internat. Cong. Appl. Chem.* [Washington and New York], 26 (1912), Sects. VII-XIb, App., p. 163).—This new method, consisting of the detection and estimation of the carbon dioxid given off by living seeds, is described.

The examination of the germinative ability of various weed seeds, H. GÜMBEL (*Landw. Jahrb.*, 43 (1912), No. 2, pp. 215-321).—The use of earth gave a higher percentage of germination with *Sinapis arvensis* than a filter paper seed bed. This weed also seemed to belong to the class of seeds the germination of which is increased by light.

The effect of light and darkness on the germination of seeds in general was influenced by the condition of the seeds, i. e., their age, ripeness, etc., and the accompanying conditions of temperature. Action of the direct rays of the sun is ascribed chiefly to the temperature variation, which caused increased germination varying with the stage of ripeness of the seeds tested. Strong direct sunlight injured the germinative ability to a high degree. Moving the seeds about in the seed bed seemed to favor germination with *S. arvensis* and *Raphanus raphanistrum* in both light and darkness. The drying of the seeds to air dryness after they had begun to swell and then returning them to moisture seemed to increase the germinative ability, especially under the influence of sunlight. Ripeness of the seed had considerable influence on these results. The weather influences, when the seeds of *S. arvensis*, *R. raphanistrum*, *Avena fatua*, and *Centaurea cyanus* were left on the surface of the ground during the winter, were found to be harmful.

The character of the soil greatly influenced the depth to which various seeds would germinate in it, the 2 extreme types being moor soil and coarse gravel. *S. arvensis* seeds appeared in 2 colors, black being the normal and brown an abnormal color which seemed to indicate disturbed development. The brown seeds, however, always showed high germinative energy under the various conditions.

The depth limit for *S. arvensis* seemed to be 7 cm., and the best results were at a depth of 3 cm. All of the weed seeds eaten by a hen and 2 pigeons were found upon examination of the excrement to have been completely digested.

Tabulated data covering 18 tests in these experiments are given.

The occurrence of viable weed seeds in the soil, K. SNELL (*Landw. Jahrb.*, 43 (1912), No. 2, pp. 323-347, figs. 2).—Examinations were made of experiment station garden soil, various cultivated fields, vegetable gardens, and forest soils to the depth in some cases of 120 cm. (47.2 in.). The soil was removed in layers of 10 cm. and the seed therein allowed to germinate. Records of these 12 examinations and tests are presented in tabular form. Although the soils

had been undisturbed in the various fields from 1 to 30 years, in some cases seeds germinated from the lowest (110 to 120 cm.) layer.

In order to study this question further, 20 earthen pots containing soil with certain weed seeds were buried in the earth, 10 of them to the depth of 1 meter and 10 to a depth of 50 cm. It is designed to take up one set (2 pots) of these pots each year for 10 years and to determine the number of viable seeds of each kind in each pot. Two sets have been removed. After being buried 2 years *Anagallis arvensis*, *Urtica dioica*, *Capsella bursa pastoris*, *Datura stramonium*, and *Mercurialis annua* do not seem to have lost vitality, while *Agrostemma githago* and *Dipsacus fullonum* disappeared the first year and *Papaver rhæas* nearly so.

In studying the effect of pressure on retarding the germination of these seeds, earthen plates containing soil with the weed seeds were placed one on another with a 2-kg. weight on the top. This pressure materially checked germination, with some variations, but without injuring the viability of the seed, notably that of *Euphorbia helioscopia* and *Plantago lanceolata*.

HORTICULTURE.

Report on the statistics of vineyards, orchards and gardens, and root crops for the season 1912-13. L. H. SHOLL (*So. Aust. Statist. Dept. Bul. 3, 1913, pp. 6*).—A statistical report on the area, production, and value of grapes, orchard and small fruits, and vegetables for the season 1912-13, with comparative data for the 4 previous seasons, and data showing the export trade in fruits and wine.

The rational manuring of truck crops, R. DUMONT (*La Fumure Raisonnée des Legumes et des Cultures Maraichères. Paris [1913], pp. 195, figs. 40*).—This is a practical treatise on the use of organic and chemical fertilizers for all classes of truck crops. The introductory chapters deal with plant nutrition, horticultural soils and fertilizers, and the general rules for the use of fertilizers. The succeeding chapters take up the fertilizer treatment of various vegetables when grown both under glass and in the open.

Investigations on the determination of plant nutrients removed from the soil by crops of peas and beans, KOCHS (*Ber. K. Gärt. Lehranst. Dahlem. 1912, pp. 115-125*).—The author here reports an analytical study of some pea and bean crops with special reference to their draft on the various plant nutrients of the soil. The results are presented in tabular form and discussed.

[Notes on the occurrence of parthenogenesis in various plants], G. HÖSTERMANN (*Ber. K. Gärt. Lehranst. Dahlem, 1912, pp. 85-107, figs. 12*).—The author here reports his observations and experiments relative to the occurrence of parthenocarpic fruits in pumpkins, melons, tomatoes, peppers, pears, and persimmons.

Fruit growing, its history and practice, H. SCHULZ (*Der Obstbau, seine Geschichte und Praxis. In Das Leben der Pflanze.—Abt. IV. Die Pflanzen und der Mensch, Vol. I. Stuttgart, 1913, pp. 371-468, pls. 4, figs. 27*).—An encyclopedic treatise on the history of fruit growing and practices employed in Germany in growing fruits and nuts. Consideration is given to the development of both formal fruit gardens and commercial orchards.

Fruit farming: Practical and scientific, C. H. HOOPER ET AL. (*London, 1912, pp. 130, figs. 67*).—A practical manual of information on the culture of orchard and small fruits. The subject matter is based upon up-to-date practices in fruit growing countries. A number of special articles by various authorities are included.

Orchard nursery work: Budding and grafting, W. J. ALLEN (*Dept. Agr. N. S. Wales Farmers' Bul. 63, 1913, pp. 26, figs. 34*).—A popular treatise on nursery practice with special reference to the art of budding and grafting.

Inspection service, control of insect pests and plant diseases, F. B. MUMFORD and L. HASEMAN (*Missouri Sta. Circ. 63, pp. 215-222*).—This circular contains the text of the Missouri state law, approved March 27, 1913, which provides for the inspection of plants by the station, and the destruction of those badly diseased.

New or noteworthy fruits, U. P. HEDRICK (*New York State Sta. Bul. 364, pp. 179-195, pls. 4*).—The author here calls attention to the work of the station in growing all of the fruit novelties offered in this country and presents descriptions of the best recent introductions as they grow on the station grounds. These include Deacon Jones, Delicious, and Opalescent apples; Lucy Duke pear; Arp Beauty, Frances, and Miss Lola peaches; Imperial Epineuse, Middleburg, Pearl, and Tennant plums; Schmidt cherry; Berckmans, Delago, Eclipse, and Secretary grapes; June and Plum Farmer raspberries; Perfection and Diplona currants; Poorman gooseberry; and Prolific and Chesapeake strawberries. Each variety is considered with reference to its history, important characteristics, and economic value.

Some good fruits recently grown, F. H. HALL (*New York State Sta. Bul. 364, popular ed., pp. 3-10, pl. 1*).—A popular edition of the above.

New varieties of the avocado for California, Part I, K. A. RYERSON (*Univ. Cal. Jour. Agr., 1 (1913), No. 4, pp. 29-36, figs. 6*).—In this article the author describes a number of varieties of avocados originated in California which are believed to be worthy of dissemination for commercial culture.

A graft hybrid between the peach and almond, L. DANIEL and J. DELPHON (*Compt. Rend. Acad. Sci. [Paris], 156 (1913), No. 26, pp. 2000-2002; Rev. Hort. [Paris], 85 (1913), No. 17, pp. 394, 395*).—The authors here describe an almond tree which was grafted with scions from a yellow fruited peach tree in 1905.

During the second year after budding the scions bore yellow fleshed peaches similar to those on the tree from which the scions were selected. The next year, however, the scions bore both peaches and almonds and intermediate forms. The hybrid shoots developed at some distance above the union and the phenomenon reproduced itself during the following years. The tree was cut down by its owner, but although they have not fruited as yet 2 young trees have been grown from seeds taken from a scion. The trees are dissimilar in appearance but each presents characteristics of foliage resembling both the peach and the almond.

Modern methods of packing apples and pears, A. McNEILL (*Canada Dept. Agr., Dairy and Cold Storage Comr. Branch Bul. 34, 1913, pp. 67, figs. 57*).—This bulletin is to some extent a revision of Bulletin 19 of the same series (*E. S. R., 19, p. 741*). The information and instruction which it contains is in line with the more recent developments in the use of the barrel and box pack for apples and pears. The text is fully illustrated.

[Investigations on the influence of fertilizers on the composition of currant juice], KOCHS (*Ber. K. Gärt. Lehranst. Dahlen, 1912, pp. 129, 130*).—Analyses of a number of samples of currant juice procured from fruit growing under various fertilizer treatments are reported. The data appear to indicate that there is no direct relation between the chemical composition of the currant juice and the fertilizer treatment given to the plants.

Preliminary results with sulphate of manganese as a fertilizer for grapes, F. A. SANNINO and A. TOSATTI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 22 (1913), II, No. 5, pp. 237-242*).—The experiments

here reported were conducted in the vineyard of the Royal Enological School of Conegliano in 1907 and 1908.

The results indicate that sulphate of manganese tends to increase the yield of grapes considerably. It also reduces the sugar content and increases the alcohol content of the must to a certain extent. Contrary to the results secured with sulphate of iron (E. S. R., 22, p. 448) the increased amount of manganese in the wine was greater when the pulps were fermented along with the skins than when the pulps were fermented alone. Manganese also appears to exert an influence on the color and odor of the wine.

Influence of spray mixtures on the germination of grape pollen, E. GARINO-CANINA (*Ann. Sci. Agron.*, 4. ser., 2 (1913), II, No. 2, pp. 113-130, figs. 10).—In a study conducted at the Viticultural Research Station, Paris, all spray mixtures commonly applied to grapes during the flowering season were tested with special reference to their influence on pollen germination. The sprayed pollen was germinated in a medium containing 15 per cent saccharose and 1.5 per cent gelatin, slightly acidulated with sulphuric acid. The results of these tests are here presented in tabular form and discussed.

All of the mixtures tested were found to have a more or less toxic action on the pollen. In case of ammoniacal copper carbonate solution and copper sulphate solution this action was not evident unless concentrates of over 0.05 per cent were used. The copper and other heavy metals appear to kill the protoplasm of the pollen grain. The application of sulphur during the flowering period is commonly believed to stimulate fertilization. In their experiments in vitro, however, the authors found that sulphur retarded germination. This is attributed to the formation of sulphuric acid or of oxalic acid, which was found in the tests to be toxic to the grapes. The toxic effect of sulphur is to be studied further and tests are also to be made relative to the influence of various treatments on the ovaries of the flowers.

The effect of humidity and cold upon grapes, E. ZACHAREWICZ (*Rev. Vit.*, 39 (1913), No. 1012, p. 672).—Cold weather, April 13 to 15, is said to have reduced materially both the quantity and quality of the grape crop for 1913.

Varieties of plantains and bananas cultivated in Seychelles, P. R. DUPONT (*Roy. Bot. Gard. Kew, Bul. Misc. Inform.*, 1913, No. 6, pp. 229-231).—Some 15 varieties of plantains and bananas which are cultivated in the Seychelles are here described.

The bureau of agriculture banana collection, O. W. BARRETT (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 9, pp. 433-439, pls. 3).—The author here lists some 276 varieties of bananas and plantains, together with 22 supposedly distinct species of *Musa* which are to be tested with reference to their identity and adaptability to Philippine conditions.

New citrus fruits, W. T. SWINGLE (*Amer. Breeders Mag.*, 4 (1913), No. 2, pp. 83-95, figs. 18).—A paper on this subject read before the American Breeders Association at Columbia, S. C., January, 1913, in which the author reviews his work in the production of the citrange, tangelo, and limquat, and discusses the possibility of making selections from these variable fruits which will serve as cold-resistant substitutes for the lemon and lime. Attention is also called to a number of wild relatives of our citrus fruits which may prove desirable for breeding purposes.

Citrus ichangensis, a promising, hardy, new species from southwestern China and Assam, W. T. SWINGLE (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1913), No. 1, pp. 1-14, pl. 1, figs. 7).—The species of *Citrus* here described in detail, including previous notices, is, so far as is known, native farther north

than any other evergreen species of *Citrus* except *C. trifoliata*. Since it also occurs at the highest altitudes reported for any wild species of the genus, it is believed to be of promise in breeding cold-resistant citrus fruits. Because of its unusually large seeds it promises to yield very vigorous seedlings and to be, in consequence, a useful stock on which to graft oranges, lemons, and other cultivated species of the genus.

A subspecies, *C. ichangensis latipes*, from Assam is also described.

Coconuts, the consols of the East, H. H. SMITH and F. A. G. PAPE (*London* [1912], pp. LVIII+506, pl. 1, figs. 69).—A handbook of information on the coconut industry, containing special sections on the cultivation of coconuts in various tropical countries, the preparation of copra, the utilization of coconut products and by-products, catch crops, subsidiary industries including cattle rearing, the question of manuring, prevention of pests, and the maintenance of health in the Tropics.

Report of the work at the experiment station, H. B. DORNER (In *Floriculture Research at the Experiment Station*. Urbana: Univ. Ill., 1912, pp. 3-14).—This paper briefly outlines the nature of the floricultural investigations at the station and discusses in detail experiments with carnations and roses conducted by the author in cooperation with A. H. Nehrling.

Fertilizer experiments with carnations and roses have shown that there is less danger of overfeeding with acid phosphate than with dried blood and potassium sulphate. Where ammonium sulphate is used in the place of the dried blood the soil dries out sooner. If large amounts of nitrogen are used there is greater danger from rust in the carnations. Nitrogen when applied at the rate of 32 lbs. per 100 sq. ft. produces serious damage in the roses which is evidenced by the yellowish, sickly color of the foliage. Grafted roses can stand more nitrogen than roses on their own roots and they also make a stronger growth and are apparently more prolific bloomers than own-root roses. The authors found that carnations grown with commercial fertilizers are the equal of those grown with natural manures.

Hardy perennials and herbaceous borders, W. P. WRIGHT (*New York* [1912], pp. 304, pls. 74, figs. 4).—A descriptive and cultural account of the best hardy perennials and those plants best adapted for herbaceous borders, including practical suggestions as to how they can be used to the greatest advantage. The text is fully illustrated.

The garden and its plantings, W. LANGE (*Der Garten und seine Bepflanzung*. In *Das Leben der Pflanze*.—Abt. IV, *Die Pflanzen und der Mensch*, Vol. I. Stuttgart, 1913, pp. 1-208, pls. 8, figs. 131).—In this work the author treats of both ornamental and utility gardens, with special reference to the selection and grouping of their plant material according to the physiognomy and characters of the individual plants.

The first 2 chapters give a historical sketch of plant utilization and the development of the modern garden. Chapter 3 discusses the adaptability of the more important plants for various situations, on the basis of a knowledge of plant physiognomy and characters. Chapter 4 discusses garden art and horticulture, including the introduction of foreign cultures into Germany.

Suburban gardens, GRACE TAYLOR (*New York*, 1913, pp. 207, figs. 21).—A popular treatise on garden designing for suburban homes.

Every day in my garden, VIRGINIA E. VERPLANCK (*New York*, 1913, pp. XXIV+174, pls. 16).—A popular guide for the cultivation of flowers, fruits, and vegetables in which the author has laid out a working plan for every day of the year.

FORESTRY.

Influence of the origin of seed upon the character of forest growth, A. ENGLER (*Mitt. Schweiz. Centralanst. Forstl. Versuchsw.*, 10 (1913), No. 3, pp. 191-386, pls. 13, figs. 23; *abs. in Quart. Jour. Forestry*, 7 (1913), No. 4, pp. 335-337).—This is the second detailed report on the author's long-continued studies relative to the influence of environment on tree growth as manifested in the progeny (E. S. R., 17, p. 667). The present report treats at length of the differences shown in the cone and seed formation and in the growth development of scots pine (*Pinus sylvestris*) plants raised from seeds collected at different altitudes in various European countries, including Switzerland. A progress report is also given on a second generation study of spruce (*Picea excelsa*) seedlings. A short review of recent literature on the question of origin of seed is included.

The author's investigations are being conducted mainly in 4 nurseries located at elevations ranging from 1,400 to 3,800 ft. His results are discussed in great detail. The general results with pine seedlings may be summarized as follows: In all of the nurseries 1- and 2-year old seedlings show a height in inverse proportion to the altitude, and also to the latitude in the case of Scandinavian seed, of the place where the mother trees grew. During the first year none of the pine seedlings completed its growth until late summer or autumn, although Scandinavian and East Prussian varieties ceased to grow from 1 to 2 months earlier than the seedlings from the low ground of Switzerland and Germany. In the second year, however, all of the seedlings ceased height growth about the end of May or beginning of June regardless of the origin of the seed.

In the lowlands the pines from all sources begin height growth about the same time, although the leaders of the pines from lowland sources extend considerably more in the presence of high temperature than the leaders of northern and alpine pines, and active growth continues over a longer period. In high situations trees raised from seed procured from northern and alpine sources begin to grow earlier and complete their height growth quicker than trees from lowland sources. Lowland pines grown in high situations show a tendency to become stag-headed owing to their cessation of growth.

No morphological variations sufficient to warrant the separation of new races from *P. sylvestris* were observed among seedlings from various sources, but the evidence shows strongly that morphological characters of the mother trees which are due to peculiar soil conditions are transmitted to the offspring. Variations in the mother trees due to weather conditions or to mechanical injuries are not transmitted. Plants raised from Scandinavian and East Prussian seeds were least susceptible to the leaf-shedding fungus (*Lophodermium pinastri*). Plants raised from alpine seeds were most susceptible to this disease no matter at what altitudes the parent trees had grown. The yellowish or brownish color which the leaves of young pines in Switzerland generally take on in autumn or winter appeared to be intimately associated with cold, dry weather in winter. Such discoloration was most marked in the case of plants raised from East Prussian and Scandinavian seeds and least marked in the case of plants raised from French, Belgian, and Scottish trees.

In the experiments with second generation spruce seed it was found that lowland spruce trees which had been making inferior growth in high situations for from 30 to 40 years transmitted their characters to the next generation; hence it appears that the selection of seed from the proper source is of great importance, especially for planting in high mountain situations.

The experiments as a whole indicate that the best seeds for any locality are those which originate in that locality, although seed from similar environments may be used to advantage when occasion requires.

The influence of too deep planting on the longevity and yield of pine, GEIST (*Ztschr. Forst u. Jagdw.*, 45 (1913), No. 9, pp. 589-596).—The author's investigations lead him to conclude that pine trees make the greatest growth when their principal roots are confined to the upper humus-containing layer of soil. Growth development appears to be retarded in direct proportion to the depth to which the trees are planted. The deeper the trees are planted the greater is the danger of gaps or broken spaces in the resulting stand.

The influence of forests upon climate, R. DEC. WARD (*Pop. Sci. Mo.*, 82 (1913), No. 4, pp. 313-331).—A popular discussion of this subject based upon a review of the literature. Special attention is given to the relation between forests and rainfall, but consideration is also given to the value of forests as windbreaks; their influence upon temperature, humidity, and evaporation; in collecting moisture from clouds and fogs; upon hail and other storms; and upon water supply, erosion, and floods, as well as the hygienic influence of forests.

The author concludes in general that, as far as this country is concerned at least, the evidence is not sufficient to show that forests have any significant effect upon the amount of rainfall. It is believed that further scientific data are needed in order to draw any definite conclusions in regard to the relation of forests to climate.

The correction of avalanches in Grisons, P. MOUGIN (*Rev. Eaux et Forêts*, 52 (1913), No. 47, pp. 513-532, figs. 8).—The author here describes various methods, including that of afforestation, employed in Grisons, Switzerland, for the control of avalanches.

Some aspects of European forestry, A. B. RECKNAGEL (*Forestry Quart.*, 11 (1913), No. 3, pp. 323-348).—A further paper on this subject (*E. S. R.*, 29, p. 342), in which the author discusses the management of hardwoods in eastern France, natural regeneration in the Black Forest, and management of alpine forests in Bavaria.

Trees and shrubs, edited by C. S. SARGENT (*Boston and New York*, 1913, vol. 2, pt. 4, pp. 191-278, pls. 25).—This is the eighth installment of the work on new or little known trees and shrubs of the northern hemisphere which is being prepared by the editor and others, chiefly from material at the Arnold Arboretum (*E. S. R.*, 26, p. 149). As in the previous installments, the important feature of this part is the illustrations, which are accompanied by descriptions of the species considered.

Trees and shrubs of New Mexico, E. O. WOOTON (*New Mexico Sta. Bul.* 87, pp. 159, figs. 26).—This bulletin supersedes a previous bulletin on the native ornamental plants of New Mexico (*E. S. R.*, 16, p. 471). Much of the general discussion of the subject is here reprinted, but the list of plants has been extended to include all trees and shrubs of New Mexico, with notes on those that are of value. Technical descriptions of the families and genera with keys for the determination of species have also been included.

Cedar woods, W. DALLIMORE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform.*, 1913, No. 6, pp. 297-224).—The author has here compiled a descriptive list of trees to which the name cedar is applied. Information is given relative to the distinguishing characteristics of the wood of each species and its use, and in cases where the wood is not generally known as cedar references are given to the works in which the name is used.

The latex system of rubber trees, A. MEUNIER (*Mém. Sci. [Belgium]*, 1 (1912), No. 1, pp. 51-17, pls. 8).—The author here reports an anatomical study

of the rubber-yielding trees of the genera *Periploca*, *Cryptostegia*, *Clitandra*, *Landolphia*, *Funtumia*, *Hevea*, *Manihot*, *Ficus*, and *Castilla*, which are believed to be of especial importance for the Belgium colonies. The structure of the different species is described and also illustrated in a series of plates.

Scientific studies of *Hevea brasiliensis*, A. W. K. DE JONG (*Dept. Landb., Nijr. en Handel [Dutch East Indies], Meded. Agr. Chem. Lab., 1913, No. 4, pp. 37, tables 10, pl. 1, figs. 12*).—The author here reports tapping experiments with *Hevea* rubber trees in which special attention was paid to the method of tapping and direction of cut in relation to the latex system of the tree. The results of these investigations are discussed at length. A fertilizer test was also conducted with a number of trees in which the complete fertilizer gave the best results.

Hevea: Yields of some Henaratgoda trees, R. N. LYNE (*Dept. Agr. Ceylon Bul. 4, 1913, pp. 61-73, figs. 2*).—This bulletin contains the results of tapping investigations conducted on 3 old *Hevea* plantations at Henaratgoda. The tests were conducted with reference to both girth measurement and the effect of stand density on the yield.

The results thus far indicate that after a certain size has been reached increased girth measurement does not necessarily mean increased yield. They also suggest the importance of allowing the trees ample room for root and crown development.

Tapping Ceara (*Manihot glaziovii*), P. ARENS (*Meded. Proefstat. Malang, 1913, No. 6, pp. 32*).—Tests of various methods of tapping Ceara rubber conducted at the Malang Experiment Station are described and suggestions are given relative to the practical application of the results.

The half-herringbone method as employed in tapping *Hevea* trees proved to be the best system for Ceara trees, but the vertical channel was found to be unnecessary. Four cuts on the half-herringbone system, 30 cm. between cuts, yielded practically twice as much as 2 cuts 30 cm. apart, but 8 cuts spaced at 15 cm. apart gave less than 3 times as much as the 2 cuts 30 cm. apart. Of cuts made on 10 trees at 40 cm., 120 cm., and 2 meters, respectively, from the ground the yield in about 6 weeks' tapping was 143.73 gm. for the lowest cuts, 106.42 gm. from the intermediate, and 103.67 gm. from the highest cuts. On another group of 10 trees cuts 30 cm. long and cuts only 15 cm. long were made on the same trees. On 5 trees the long cuts were made below a height of 50 cm. and the short cuts above 1 meter. On the other 5 trees the positions were reversed. In 6 weeks' daily tapping the long cuts yielded 174.23 gm. and the short cuts 111.44 gm.

Three years is believed to be sufficient time to allow for bark renewal on Ceara trees since it takes place much more rapidly than on *Hevea* trees. The results of the tests as a whole indicate that the culture of Ceara rubber should be confined to locations where *Hevea* rubber can not be grown successfully.

Wood-using industries of Ontario, R. G. LEWIS and W. G. H. BOYCE (*Dept. Int. Canada, Forestry Branch Bul. 36, 1913, pp. 127*).—This comprises an account of the quantity, value, and source of supply of the different kinds of wood used by the various industries of Ontario. It includes detailed descriptions of the different classes of industries and of the properties of the woods used therein.

Forest products of Canada, 1912.—Poles and cross-ties, R. G. LEWIS and W. G. H. BOYCE (*Dept. Int. Canada, Forestry Branch Bul. 39, 1913, pp. 16*).—A statistical report of the quantity, value, and kinds of poles and cross-ties used in Canada in 1912 with comparative data for 1911.

DISEASES OF PLANTS.

Factors affecting susceptibility to disease in plants, I. G. T. SPINKS (*Jour. Agr. Sci. [England]*, 5 (1913), No. 3, pp. 231-247, pl. 1).—This is an account of investigations regarding chiefly the relations existing between nutrition and susceptibility to disease in plants, wheat being the host and *Erysiphe graminis* the fungus employed, certain constituents of the standard nutrient solution being varied or replaced in the several cultures in order to test the influence of each on the growth of the plantlets. The conclusions reached are as follows:

"Susceptibility to mildew and yellow rust in wheat, and to mildew in barley, is increased by providing the plants with large amounts of available nitrogen; ammonium sulphate and sodium nitrate seem to be equally effective in this direction. Mineral manures, especially potash salts, on the contrary, decrease the susceptibility to disease but can not counteract the effect of large quantities of nitrogenous manures. Plants which are semistarved as regards nitrogen exhibit a considerable degree of immunity, even if the phosphates and potash are also present only in small quantities.

"Lithium salts are also effective in producing immunity, while nitrates of lead and zinc, particularly the latter, render plants extremely susceptible. Other salts of lead and zinc have very little effect on the susceptibility of plants.

"A variety of wheat which is almost immune to a disease (such as Little Joss to yellow rust) tends to retain its immunity even when supplied with excess of nitrogenous food material.

"Increased immunity does not appear to be due to a lack of food material available for the fungus in the host, . . . because the plants rendered relatively immune by adding phosphates or potash to their food supply were as healthy and well grown as those receiving no such additions. It yet remains to be seen what physiological explanation can be found to account for the changes in susceptibility which can be produced in plants by the above means."

The sterilization of seed, IVY MASSEE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform.*, 1913, No. 5, pp. 183-187, pls. 2).—Tabulated details are given of numerous tests made by the author on various seeds and fungus spores to ascertain the effects thereon of hydrogen peroxid bearing on its employment as a fungicide, the general results of which are as follows:

The spores of fungi, also some kinds of bacteria, are as a rule killed by an hour's immersion in hydrogen peroxid; no spores experimented with germinated after similar treatment for 2 hours. The germination of seeds immersed in hydrogen peroxid was retarded. In some cases the plants from treated seeds are distinctly larger at the end of 3 weeks than those from untreated seeds. For all practical purposes, soaking seed in hydrogen peroxid for 3 hours will kill all superficial fungus spores and the seed will not be injured. This method is recommended as a substitute for fumigation, which, as a rule, does not kill fungus spores, unless continued for such a time as to damage the seed.

Biological and morphological study of a new *Aspergillus*, A. SARTORY and H. SYDOW (*Ann. Mycol.*, 11 (1913), No. 2, pp. 156-160, pl. 1).—Detailed results are given of the study of *A. sartoryi* n. sp., which is said to be able to flourish at temperatures up to 43° C.

Study of a new *Penicillium*, A. SARTORY (*Ann. Mycol.*, 11 (1913), No. 2, pp. 161-165, pl. 1).—The author claims this to be a new species closely approximating *P. glaucum*, but with the difference that this form, *P. gratioli* n. sp., is a thermophile, bearing temperatures up to 49 or 50° C.

A bacteriosis of *Ixia maculata* and of *Gladiolus colvilli*, G. SEVERINI (*Ann. Bot. [Rome]*, 11 (1913), No. 3, pp. 413-424, pl. 1).—These studies, carried out

on certain soft tuber rots of *G. colvilli* and *I. maculata*, are said to show that these are produced by two bacteria claimed to be new and named *Pseudomonas gladioli* and *Bacillus ixiæ*, which also proved able to produce disease on other plants. Conditions indispensable to the progress of the disease after infection are a temperature of 25 to 30° C. and a high degree of humidity.

The enzymatic activity of two bacteria pathogenic to plants, G. SEVERINI (*Ann. Bot. [Rome]*, 11 (1913), No. 3, pp. 441-452).—As a result of further study of *Pseudomonas gladioli* and *Bacillus ixiæ* (see above) the author states that both these produce pectinase, showing about equal activity in each case. It is claimed also that invertase, amyloextrinase, and maltase are produced by both, but much more abundantly by *B. ixiæ*. *P. gladioli* produces proteolytic enzymes which long retain their activity.

Annual report for 1912 of the botanist, R. H. BIFFEN (*Jour. Roy. Agr. Soc. England*, 73 (1912), pp. 284-289).—In addition to a report of the results of seed testing work, the author gives an account of a number of diseases observed on various economic plants.

Serious injury following the spraying of potatoes with a mixture of 8 lbs. of copper sulphate and 10 lbs. of sal soda in 40 gal. of water led the author to conduct some experiments to test the effect of a fungicide of this strength. The treated plants became yellow and were partially defoliated. Later leaves were put forth that were quickly attacked by the fungus *Phytophthora infestans*.

Brief notes are given on the occurrence on specimens of sainfoin and alfalfa of sclerotia similar to those produced by *Sclerotinia trifoliorum*. The possibility of controlling this fungus with the application of fresh lime is being tested on a large scale and spraying with fungicides on a smaller scale.

Considerable loss to wheat and other cereals is reported as due to rust, mildew, smut, and also attacks of *Septoria graminis* and *Cladosporium herbarum*. *Helminthosporium graminum* on barley is reported, and it is said that injury may be prevented by soaking the seed in a dilute solution of formalin for 5 or 10 minutes.

The occurrence of silver leaf on Victoria plums, apple trees, and laurel is reported, and as curative measures are said to be unsatisfactory the destruction of the trees is recommended. Specimens of an obscure disease, popularly known as leaf scorch of the apple, were received from a number of fruit growing districts, but all attempts to find a fungus capable of causing the disease have failed.

Report of the Hohenheim Institute for Plant Protection, 1912, O. KIRCHNER (*Württemb. Wehnbl. Landw.*, 1913, Nos. 29, *Beilage*, pp. 439-442; 30, *Beilage*, pp. 455-457).—This is a condensed account of some investigations made during the year on the nature, progress, prevention, and treatment of numerous pests and diseases affecting grains, grasses, vegetables, fruits, vines, ornamental plants, etc.

Field experiments with flag smut, R. W. PEACOCK (*Agr. Gaz. N. S. Wales*, 24 (1913), No. 5, pp. 381-384).—This disease, due to *Urocystis tritici*, is said to be gradually spreading each year in New South Wales and to be seriously interfering with the quantity of wheat produced. It is estimated that in parts of Australia as much as 50 per cent of the crop has been lost in this way. This first year's experimentation, admittedly tentative, but fairly consistent in the two plantings, apparently shows that treatment with copper sulphate and lime water is effective in destroying the spores on infected seed grain, but that the presence of diseased parts of plants plowed under may prove a source of infection even when the seed has been treated. The use of stable manure was followed by infection, but this result was not regarded as conclusive.

On pure cultures of *Phytophthora infestans*, and the development of oospores, G. H. PETHYBRIDGE and P. A. MURPHY (*Sci. Proc. Roy. Dublin Soc., n. ser.*, 13 (1913), No. 36, pp. 566-588, pls. 2).—The authors state, as the result of further work with *P. infestans* (E. S. R., 29, p. 549), that results were obtained confirmatory of the work of Clinton (E. S. R., 25, p. 348), showing that in pure cultures in certain artificial media *P. infestans* does form "sexually produced spores or oospores," but they admit that one can not be certain as yet that an actual process of fertilization occurs. It is stated that the authors found oospores to have been produced in at least one-third of the cases examined by them. They regard such spores as having been developed parthenogenetically. They were not able to state whether oospores are developed in the potato plant, but they apparently regard such production as possible, and a possible means of keeping the fungus alive over winter is by their dropping into the soil and reinfecting the crop in the following spring.

The use of the green muscardine in the control of some sugar cane pests, J. B. RORER (*Phytopathology*, 3 (1913), No. 2, pp. 88-92, pl. 1).—Froghoppers, moth borers, and the larvæ of beetles are said to be among the most serious sugar cane pests in the West Indies. All of these have been found susceptible to the green muscardine, an epizootic disease caused by the fungus *Metarrhizium anisopliæ*. The author has carried on a series of investigations with this fungus and developed a method for its successful use in the field.

The stem rot or Hawaiian "iliau" disease of sugar cane, C. W. EDGERTON (*Phytopathology*, 3 (1913), No. 2, pp. 93-98, pl. 1).—A description is given of a disease of sugar cane in Louisiana which has been under observation since 1910. The author considers it identical with that described as *Gnomonia iliau* from Hawaii (E. S. R., 28, p. 53).

In Hawaii the disease is said to be more severe in the cooler regions, and it is found more prevalent in northern Louisiana, but this is believed to be due not to the difference in temperature but to the methods of saving and planting cane as practiced by the farmers in the different sections.

Club root in South Africa, I. B. P. EVANS (*Agr. Jour. Union So. Africa*, 6 (1913), No. 1, pp. 93-97, figs. 2).—The first authentic record of the occurrence in South Africa of club root of cabbage and cauliflower, due to *Plasmodiophora brassicæ*, is reported. An investigation showed that the disease, under the name dik-voet, has been known for 12 or 15 years in a portion of the Cape Province, where it has caused some little injury, but it seems now to be widespread and quite destructive. So far it has not been reported as attacking turnips, being principally confined to cabbages and cauliflowers. The author recommends the removal and destruction of all infected plants, the use of lime, and the rotation of crops so as to avoid cruciferous plants as much as possible.

Celery blight, or rust, and its prevention, E. S. SALMON (*Gard. Chron.*, 3, ser., 53 (1913), Nos. 1382, pp. 414-416, figs. 6; 1384, pp. 3, 4, fig. 1).—This disease of celery, otherwise called leaf spot or leaf scorch, and in the United States late blight, and said to be widespread and destructive, was studied by the author who reports substantially as follows:

This fungus, *Septoria petroselinii* apii, is often present on celery long before it is noted in the summer, sometimes even in the seed bed, causing damage during the entire growing period. Dipping the plants while in process of transplanting in Bordeaux mixture and spraying them three times with the same (in June, July, and August) are said to be safely protective.

Lettuce drop, O. F. BURGER (*Florida Sta. Bul.* 116, pp. 25-32, figs. 3).—A description is given of a disease of lettuce due to *Sclerotinia libertiana*, which has become very serious in parts of Florida. In addition to lettuce the same fungus was found to attack celery and cabbage in the fields. For its control the author

recommends the removal of all diseased plants, drenching the place where the infected plant stood with Bordeaux mixture or copper sulphate solution, and rotation with unsusceptible crops.

A disease of tomatoes, F. T. BROOKS and S. R. PRICE (*New Phytol.*, 12 (1913), No. 1, pp. 13–21, figs. 13; *abs. in Bot. Centbl.*, 123 (1913), No. 2, p. 30).—This is an account of the authors' experiments with the fungus called *Ascochyta citrullina*, also known by its pycnidial stage as *Mycosphaerella citrullina*, and found on muskmelons in the United States, as stated by Grossenbacher (E. S. R., 21, p. 148), and on tomato and cucumber plants in England by Massee (E. S. R., 22, p. 50).

"The results of these inoculation experiments make it clear that the fungus causing a rot of the fruit is identical with that which induces canker on the stem. . . . In view of the apparent absence of a perithecial stage in this country and of the fact that the tomato plant is an annual, it is not clear how the disease is propagated from one year to another. . . . There is no evidence yet that the fungus is propagated in the seed. On out-door plants the disease does not appear to develop until almost fully grown. Only 3 per cent of the plants were affected and the distribution of diseased plants was sporadic, so that the disease is not likely to become a serious pest to growers of out-door tomatoes."

Tomato diseases, P. H. ROLFS (*Florida Sta. Bul.* 117, pp. 33–48, figs. 2).—Descriptions are given of rust (*Macrosporium solani*), fungus blight (*Fusarium* sp.), Sclerotium blight (*S. rolfsii*), bacterial blight (*Bacillus solanacearum*), dropping of bloom buds, leaf curl or roll leaf, damping off, hollow stem, black spot (*Alternaria solani*), and blossom-end rot, which is thought probably to be caused by different species of fungi and a bacterium. In addition to the descriptions of these diseases, remedies are suggested so far as they are known.

Silver leaf disease, II, F. T. BROOKS (*Jour. Agr. Sci. [England]*, 5 (1913), No. 3, pp. 288–308, pls. 2).—Reporting on further studies of silver leaf disease (E. S. R., 26, p. 448) and quoting a recent report by Güssow (E. S. R., 28, p. 348), the author concludes that silver leaf is a pathological condition of widespread distribution, the chief cause of which is the fungus *Stereum purpureum*, although examples of silvered foliage have come under observation which can not be attributed to the action of this fungus. Silver leaf is considered to be a general pathological phenomenon which may be caused in various ways, although at present only one of these agents is known with certainty. It appears likely that it may be caused also by physiological disturbances which are not connected with the action of any parasitic organism, such as a disturbance in the transpiration current induced by the presence of the fungus. The author thinks the manifestation of silver leaf depends partly upon leaf structure, and as the phenomenon of silver leaf can not always be attributed to *S. purpureum* the destructive influence is not invariably accompanied by this peculiar affection of the leaves.

A bibliography is appended.

The Jonathan spot rot, M. T. COOK and G. W. MARTIN (*Phytopathology*, 3 (1913), No. 2, pp. 119, 120).—Attention is called to the Jonathan spot, a storage trouble that often makes its appearance soon after the fruit comes from the cold storage. In addition to the Jonathan a number of other species of apple are similarly affected.

An examination made of the spots showed that fully 90 per cent of them gave a luxuriant growth of *Alternaria*, and repeated inoculation experiments indicated that this fungus can cause typical spot rot.

The authors state that there are three different species or varieties of *Alternaria* causing apple rots, one causing a blossom-end and core rot, one a dry

spot rot on the Jonathan and possibly on other varieties, and one or more causing or following storage rots.

Jonathan fruit spot, J. B. S. NORTON (*Phytopathology*, 3 (1913), No. 2, pp. 99, 100).—Attention is called to the action of gas on Jonathan and other apples in storage by which injury resembling that known as Jonathan fruit spot is produced. It is suggested that ammonia from the cooling apparatus may be a common cause of the so-called Jonathan spot.

Studies on the water core of apple, P. J. O'GARA (*Phytopathology*, 3 (1913), No. 2, pp. 121–128, figs. 2).—The author claims that water core is a trouble which is found wherever apples are grown, being very prevalent in districts where there are great ranges of temperature and relative humidity. The addition of water to orchards either naturally or artificially, when followed by extremely high maximum temperatures with low humidity during hours of sunshine and low temperatures with high humidity during the night, will induce water core. It is claimed that water-cored fruits are most commonly found on the terminals and on the south and southwest sides of trees, as such fruits are subject to greater extremes of temperature; and that heavily pruned trees or trees defoliated shortly before the ripening period begins are very liable to water core if the climatic conditions are favorable to the disease.

Under proper conditions of storage, water-cored fruit, unless badly affected, will entirely recover.

Fire blight of pear and apple, J. G. HALL (*Washington Sta. Popular Bul.* 56, pp. 8, figs. 4).—A popular description is given of fire blight of pear and apple, due to *Bacillus amylovorus*, with suggestions for its control.

In addition to the apple and pear the fire blight is also known to attack the quince, apricot, plum, wild hawthorn, and service berry.

The control measures recommended consist in thoroughly cutting out the diseased portions of the trees. Where irrigation is practiced it is recommended that the amount of water used be reduced to the smallest quantity that will keep the trees in a healthy condition.

The brown rot canker of the peach, R. A. JEHLE (*Phytopathology*, 3 (1913), No. 2, pp. 105–110, pl. 1).—During the summers of 1911 and 1912 the author investigated a canker of peach trees prevalent in Niagara County, New York.

The cankers were found on limbs of all sizes but were most prevalent on those which were about 1 to 2 in. in diameter. The brown rot fungus, usually referred to as *Sclerotinia fructigena*, was found to be the cause of the cankers on the trees. At first the regions appear as slight depressions but soon become open wounds with copious gum flow. Later they become black and rough, and increase in size from year to year. The author states that the cankers may be formed by the fungus growing back from a brown rotted fruit through the fruit spur into the limb, but infection of the blossoms is thought to be the more common source of the trouble. Inoculations were made with *S. fructigena* obtained from a number of sources, and in more than 200 instances infection occurred on limbs of all ages.

The author has under observation cultures of *S. cinerea* and *S. fructigena* from Europe and is comparing them with the American form. At present he is of the opinion that the common form usually called *S. fructigena* is in reality *S. cinerea*.

A leaf disease of papaya, A. MAUBLANC (*Lavoura; Bol. Soc. Nac. Agr. [Brazil]*, 16 (1912), No. 10–12, pp. 204–212, pls. 2; *Bul. Trimest. Soc. Mycol. France*, 29 (1913), No. 3, pp. 353–358, pl. 1).—The author states that the leaves of *Carica papaya* in Brazil, and especially in the vicinity of Rio de Janeiro, are frequently attacked by a fungus which causes the formation of small spots,

visible on both surfaces of the leaf. A study of the fungus has shown that it belongs to the genus *Sphærella* and the name *S. caricæ* n. sp. is given it.

Abnormal roots of figs, F. A. WOLF (*Phytopathology*, 3 (1913), No. 2, pp. 115-118, pl. 1).—A description is given of abnormal roots formed on the trunk and larger branches of a fig tree in Alabama.

Combating anthracnose, E. ZACHAREWICZ (*Rev. Vit.*, 39 (1913), No. 1015, p. 760).—The author states that powdered lime, cement, and mineral superphosphate, in the proportions by weight of 2:1:1, applied three times at intervals of 10 days, have generally been found sufficient to check the progress of anthracnose on grapevines.

Treatments of gray rot of grapes, A. THOURET and J. L. VIDAL (*Rev. Vit.*, 40 (1913), No. 1023, pp. 117, 118).—Formulas and directions are given for making and applying various treatments for the control of *Botrytis cinerea*, including both liquids and powders claimed to be adapted to various conditions of weather, etc. Soap and gelatin are employed in some of the liquid forms.

Studies on grape diseases in 1912; attacks of black rot, J. CAPUS (*Rev. Vit.*, 39 (1913), No. 1010, pp. 581-583).—This disease is said to be more widely extended than formerly, though not more severe at any given place. A detailed account is given of the progress of infection. In the various outbreaks observed, the author notes a progress and sequence similar to that of downy mildew and the same correspondence with periods of rain and low temperature.

Studies on grape diseases in 1912; the outbreaks of downy mildew in Gironde, J. CAPUS (*Rev. Vit.*, 39 (1913), No. 1009, pp. 545-548).—The author gives details of observations made regarding mildew attack in 1912.

Up to July 18 receptivity to the fungus was confined mainly to the very susceptible varieties, but after that time it became much more general, and continued prevalent during the summer. The conclusion is reached that during the year in question both spores and external favoring conditions were present, but that in the first half of the year most varieties seemed quite resistant. After July 18 the receptivity of the plants was much increased as regards some portions of the vines, although the clusters were not seriously attacked.

Studies on grape diseases in 1912; attacks of downy mildew in Aude, J. CAPUS (*Rev. Vit.*, 39 (1913), No. 1011, pp. 613-618).—It is stated that the progress of the mildew attack in the Department of Aude in 1912 was similar to that in Gironde in years showing the same sequence of seasonal variation: that attacks of mildew and arrest of growth correspond to periods of low temperature; and that the infection of the clusters coincides in time with that of the leaves, but that the incubation period may be longer on the clusters than on certain of the leaves. It is thought also that receptivity may appear in case of the clusters and not of the leaves in some cases and vice versa. Lateness of flowering, it is said, is generally associated with violence of mildew attack.

Studies on grape diseases in 1912; experiments with a new method of treatment for downy mildew, J. CAPUS (*Rev. Vit.*, 39 (1913), No. 1013, pp. 693-696).—The author reports that Burgundy mixture applied on both sides of the leaves during June and July proved equally effective, but that in later applications, its use on the lower surfaces seemed to give the better results. It is held also that thorough application in the usual way (that is, reaching the upper surfaces mostly) just before the time of infection will ordinarily prevent serious damage.

Studies on grape diseases in 1912; receptivity to mildew, J. CAPUS (*Rev. Vit.*, 39 (1913), No. 1014, pp. 720-724).—As the result of studies during 1912 on the receptivity of grapevines to mildew, the author states that a given variety

may be entirely resistant to attack throughout the season; that a particular stock may be throughout less resistant than another of the same variety; that a stock or variety may be more sensitive under given conditions of development (as age, soil, season, etc.) than another; and that stocks of the same variety and even individual plants may show fluctuations as to sensitivity which appear to depend rather upon the state of the natural defenses of the plant than upon intensity of attack or other conditions. Some plants, it is said, are completely resistant while very young, later showing resistance or sensitivity according to certain circumstances, and still later, usually in August, showing susceptibility continuing throughout the season. Late pruning with a view to retarding the rather forward growth of 1912 is said to have favored mildew attack. Relative resistance as evidenced by a smaller proportion of surface attack and absolute resistance as shown by complete immunity appear to be phenomena of the same order, differing only in degree, being determined largely by the conditions of the vegetative medium (such as age of organ or of stock, their situation as regards moisture, etc.) and possibly to a certain extent by root formation.

An outbreak of mildew, M. BAILLY (*Rev. Vit.*, 39 (1913), No. 1019, pp. 876-878, figs. 2).—Observations made by the author on downy mildew in Burgundy, Champagne, and Loire, are said to lead to the conclusion that atmospheric conditions of a general nature are probably in causal association with these attacks.

Precise data regarding an attack of mildew, LABERGIERE (*Rev. Vit.*, 40 (1913), No. 1021, pp. 55, 56).—The author claims that observations made on the differences in degrees of attack resulting in a vineyard in blossom which was sprayed partly before and partly during a fine rain blowing from the south enabled him to ascertain the exact hour of its infection by downy mildew. The parts sprayed before the rain began were almost entirely free from mildew, while the portions treated during its progress were heavily attacked and some not treated at all showed almost a total loss of crop. Fourteen days were required for the development of the fungus.

Treatments for Oidium of grapevines, A. THOURET and J. L. VIDAL (*Rev. Vit.*, 39 (1913), No. 1016, pp. 798, 799).—Formulas for fungicides are given, also directions as to times and methods of their application.

Wetting power of fungicidal mixtures, V. VERMOREL and F. DANTONY (*Rev. Vit.*, 39 (1913), No. 1015, pp. 759, 760).—In continuance of previous reports (*E. S. R.*, 27, p. 548; 29, p. 451), the authors state that all copper sprays may be effectively and economically rendered adherent for grapevines by the addition of 1 per cent of gelatin in the case of an acid reaction and of 2 per cent casein in alkaline sprays.

A spreading and adherent form of Bordeaux mixture, J. CHAUZIT (*Rev. Vit.*, 39 (1913), No. 1015, pp. 764-766).—It is stated that the addition of casein to Bordeaux mixture as recommended by Vermorel and Dantony (see above) renders it especially adherent; that the casein does not enter into combination with the copper or cause it to take an insoluble form; that the copper compound retains its strength and its full efficacy, being simply held to the leaf, shoot, or berry as by a paste; and that in addition the casein confers upon the fungicide a greater spreading capacity and a higher surface viscosity.

Prevention and treatment of American gooseberry mildew, L. HILTNER and KORFF (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser.*, 11 (1913), No. 6, pp. 73-77).—A 3 years' course of treatment with sprays and fertilizers, particulars of which are given, apparently freed severely infected plants from American gooseberry mildew.

It is recommended that all importations be strictly inspected to guard against further spread of the disease. Infected plants or parts are to be destroyed by fire and neighboring vegetation to be sprayed 3 or 4 times with 0.4 to 0.5 per cent potassium sulphate solution, or preferably 2 per cent copper-lime solution. Severe cutting back late in the fall and burning of prunings are recommended, with application of quicklime to the soil surface and of 2 per cent milk of lime to the plants, these applications being repeated in the spring. Suggestions are made also regarding the employment of fertilizers which have been found helpful in combating this disease.

The Surinam witches' broom disease of cacao, J. B. ROBER (*Bd. Agr. Trinidad and Tobago Circ. 10, 1913, pp. 13*).—Pursuant to a previous communication (E. S. R., 23, p. 455) the author gives the results of two series of studies recently made by him on witches' broom of cacao, concluding that this disease is of fungal origin, probably due to a basidiomycete. It is thought that it can be controlled by spraying with Bordeaux mixture, which is considered a more rational method of treatment than the severe cutting back recommended by van Hall and Drost (E. S. R., 20, p. 1141).

Coffee disease in East Africa (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1913, No. 5, pp. 168-171*).—The recent recognition in Uganda of the coffee disease caused by *Hemileia vastatrix* has necessitated a reexamination of the Hemileia material which has reached Kew from time to time from Tropical East Africa. Careful comparison of that material with type specimens of both *H. vastatrix* and *H. woodii* has also been necessary. The chief result of the examination is said to be the establishment of the fact that there is no record of coffee being attacked by any species of Hemileia other than *H. vastatrix*.

The resistance of a variety of *Helianthus annuus* to *Orobanche cumana*, T. SATSYPEROV (*Trudy Biūro Prikl. Bot. (Bul. Angew. Bot.), 6 (1913), No. 4, pp. 251-261*).—The results of experiments carried out at the Saratov Experiment Station in 1912 are said to show that the variety of *H. annuus* in question possesses a high degree of resistance to *O. cumana*.

Notes on some diseases of trees in our National Forests, III, G. G. HEDGCOCK (*Phytopathology, 3 (1913), No. 2, pp. 111-114*).—In continuation of a previous report (E. S. R., 27, p. 653), the occurrence of *Polyporus dryophilus* or a closely allied species as a cause of a disease of the heartwood of the aspen (*Populus tremuloides*) is reported in some portions of Colorado. *Armillaria mellea* is also said to attack the roots of many species of trees both in the eastern and western forests.

Notes are given on the winter and frost injuries to trees and on smelter injury to forests. This latter is in continuation of a previous report (E. S. R., 26, p. 826). The author has found that the belt of acute smelter injury in the Deerlodge National Forest in the vicinity of Anaconda, Mont., has been greatly extended during 1911 and 1912. The limber pines on hills adjacent to the smelter show an acute form of smelter injury and are slowly dying. An examination of the limber pines, even at a distance of 10 miles from the smelter, showed a gradual diminution of growth in the accretion rings, and it is thought that under the existing conditions there is no hope of natural reforestation.

Notes on diseases of trees in the southern Appalachians, I, A. H. GRAVES (*Phytopathology, 3 (1913), No. 2, pp. 129-139, figs. 10*).—This is the first of a series of articles in which the author expects to give the results of an investigation on the diseases of trees in the southern Appalachians. In this paper some diseases of white pine are described, among them bark blight due to *Coccomyces pini*, heart rot caused by *Trametes pini*, and leaf blight attributed to *Lophodermium brachysporum*.

Some observations on *Polyporus berkeleyi*, J. R. WEIR (*Phytopathology*, 3 (1913), No. 2, pp. 101-104, pl. 1).—The author reports collecting *P. berkeleyi* in constant association with the western larch (*Larix occidentalis*). There was found no evidence that the mycelium was able to attack living wood, but it appeared to extend into the wood of trees injured by fire.

Germination studies with spores of *Merulius*, C. WEHMER (*Ber. Deut. Bot. Gesell.*, 31 (1913), No. 6, pp. 311-316).—The author reports that his attempts at demonstrating reproduction and spread of *M. lacrymans* by means of spores made under different and favorable conditions were wholly without result though continued for about three years, this outcome being contrasted with that reported by R. Falck (*E. S. R.*, 28, p. 751). An apparent exception to this general result was noted in which old spores were found to be covered with mycelium, but the latter proved to belong to a different species.

A further account is to appear later.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Directory of officials and organizations concerned with the protection of birds and game, 1913, T. S. PALMER (*U. S. Dept. Agr., Bur. Biol. Survey Circ.* 94, pp. 16).—This fourteenth annual directory of officials and organizations concerned with the protection of birds and game in the United States and Canada is arranged on the same plan as those previously issued (*E. S. R.*, 28, p. 56), and has been revised to July 15, 1913.

The rat, a sanitary menace and an economic burden, R. H. CREEL (*Pub. Health Rpts. [U. S.]*, 28 (1913), No. 27, pp. 1403-1408).—This paper emphasizes the importance of the rat, particularly as a menace to health.

The amended insecticide law, C. W. WOODWORTH (*California Sta. Circ.* 104, pp. 10).—This circular gives the full text of the law of 1911 (*E. S. R.*, 25, p. 764) as it now stands with footnotes on each of the changes made in 1913.

Analyses of insecticides for users, G. P. GRAY (*California Sta. Circ.* 105, pp. 7).—This circular presents rules and regulations drawn up to assist in carrying out the provisions of the insecticide law relating to analyses of insecticides for users, and gives directions for the sampling of various insecticides.

Powdered arsenate of lead, A. W. MORRILL (*Southwest. Stockman*, 1913, No. 42, p. 10).—The author concludes that there is no reason why the use of arsenate of lead in powdered form should be discouraged on account of greater danger to workmen in its manufacture or to users in the orchard or garden as compared with the paste form of the same insecticide.

[Insect pests and their control in St. Lucia] (*Rpt. Agr. Dept. St. Lucia*, 1911-12, p. 11; *abst. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 3, p. 76).—A capsid is reported to have practically destroyed a trial plot of tobacco in the Soufrière districts. The white-headed fungus (*Ophionectria coccicola*), which attacks scale insects, was found to occur in St. Lucia. The burrowing scale (*Howardia biclaris*) on the stems of young *Castilla elastica* plants in the nursery was discovered to be parasitized by the red-headed fungus (*Sphaerostilbe coccophila*).

Injurious insects in the Government of Moscow during 1912 (*Mat. po Izuch. Vredn. Nasëk. Moskov. Gub.*, 4 (1912), pp. 1-101; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 6, pp. 205-216).—Insects injurious to fruit gardens are discussed by D. M. Korolkov; those injurious to vegetable gardens, by V. A. Leftejew; and field pests, by A. D. Baranov.

[Insect pests in Java] (*Meded. Proefstat. Midden-Java*, 1912, No. 4, pp. 17-23; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 1, pp. 3-5).—This is a report on the occurrence of insects of economic importance and investigations thereof.

[Insects in Sumatra], DEBUSSY (*Médec. Deli Proefstat. Medan*, 7 (1912), No. 4, pp. 129-148; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 1, pp. 13-14).—This paper discusses the results obtained in the importation of parasites from this country in the attempt to control *Heliothis obsoleta*. *Trichogramma pretiosa* has been very successfully introduced, the eggs of more than a dozen different species of Lepidoptera having already been attacked by it. Insecticides for use on tobacco, a species of hawk moth attacking tobacco which has made its appearance in Sumatra, the coccinellid *Megilla maculata* imported from America, and a tenebrionid beetle *Opatrum* sp. which attacks tobacco, etc., are also briefly discussed.

Garden and truck crop insect pests, C. E. SANBORN (*Oklahoma Sta. Bul.* 100, pp. 76, figs. 79).—This bulletin presents brief popular illustrated accounts of the more important insect enemies of truck and garden crops in Oklahoma, and includes directions for the preparation and application of insecticides.

Insect enemies of lentils, P. NOEL (*Bul. Lab. Régional Ent. Agr. [Rouen]*, 1913, No. 2, pp. 11, 12; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 4, p. 123).—Some 12 pests are listed.

The enemies of the orach (*Atriplex hortensis*), P. NOEL (*Bul. Lab. Régional Ent. Agr. [Rouen]*, 1913, No. 1, pp. 6-8).—Fifty-seven insects and arachnid pests of this plant are listed.

Two enemies of the coconut palm in the Malgasy region, A. VUILLET (*Agron. Colon.*, 1 (1913), No. 2, pp. 33-37, pl. 1).—The lymexylonid beetle *Melittomma insulare* and the curculionid *Rhina nigra* are the pests here noted.

Text-book of forest entomology, O. NÜSSLIN (*Leitfaden der Forstinsektenkunde*. Berlin, 1913, 2. rev. and enl. ed., pp. XVI+522 figs. 438).—The first of the 2 main divisions (pp. 10-45) of this work, which follows a brief introduction, deals with the zoological side of the subject and includes a discussion of the general relations of insects to forestry. The second main division (pp. 46-498), which makes up the greater part of the volume, deals with the various insects of economic importance under their respective orders and genera. The author first gives a concise description of the distinguishing features of each genus, and then deals more in detail with the genera and species of particular importance to the forester, gives a brief outline of the biology of the family and its relation to forestry, methods of combating it, etc.

The appendix contains an outline of collecting excursions for students attending lectures at the forestry school in Karlsruhe.

Insect enemies of camphor trees, H. MORSTATT (*Pflanzer*, 8 (1912), No. 1, pp. 18-24, pl. 1; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 1, p. 11).—Brief reference is first made to the insect enemies of camphor trees in other countries. The species mentioned as enemies of the camphor tree in German East Africa include *Trichotoron heymannii*, *Tetranychus* sp., *Zonocerus elegans*, *Dicasticus gerstaeckeri*, *Systates irregularis*, *Tragocephala pretiosa*, *Disphinctus* sp., *Aspidiotus destructor*, *A. cyanophylli*, etc.

Insect enemies of the osier, J. FEYTAUD (*Bul. Soc. Études et Vulg., Zool. Agr.*, 11 (1912), No. 4, pp. 89-97, pls. 2, figs. 3; *abs. in Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 1, pp. 156, 157).—The osier, particularly *Salix viminalis*, which is one of the most common species in the osier beds in southwestern France, is attacked by several insects. Of these pests *Earias chlorana*, the species here considered, causes serious injury, in some plantations more than 50 per cent of the shoots being attacked.

Contribution to the study of the Thysanoptera of France, A. VUILLET (*Insecta*, 3 (1913), No. 27, pp. 77-84, figs. 12; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 4, p. 124).—The calyxes of carnations (*Dianthus caryophyllus*) are

said to be deformed in the vicinity of Marseille by a thrips of the family Phleothripidae. This is described under the name *Porphyrothrips cottei* n. g. and n. sp.

Nysius senecionis and its damage to the vine, L. SEMICHON and F. PICARD (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 33 (1912), No. 33, pp. 203-206).—This plant bug is commonly the source of injury in vineyards, where it attacks the leaves, the leaf stalks, and the young branches, causing rapid withering of the lower leaves, very shortly followed by that of the entire upper part of the plant.

The chinch bug and its control, L. HASEMAN (*Missouri Sta. Circ.* 62, pp. 211-214).—A brief account of the chinch bug with a summary of the means to be employed in its control.

A parasite of the chinch bug egg, J. W. MCCOLLOCH (*Science, n. ser.*, 38 (1913), No. 976, pp. 367, 368).—A proctotrypid parasite apparently belonging to a new genus near *Telenomus* has been reared by the author from the eggs of the chinch bug. "The parasite has been found in every wheat and corn field examined around Manhattan. Of 3,101 eggs collected between April 28 and June 10, the average percentage of parasitism was 20.8, and of 116 eggs collected at Crawford (central Kansas) the percentage of parasitism was 16.3. The insect has also been taken at Dodge City (southwestern Kansas)."

The Psylla disease of indigo in Behar, H. MAXWELL-LEFROY (*Agr. Jour. India*, 8 (1913), No. 1, pp. 1-26, pls. 4).—This paper relates to *Psylla isitis*, its life history, habits, injury, natural enemies, and preventive and remedial measures.

Plant lice or green fly, J. DAVIDSON (*Watford, Eng.: Cooper Lab. Econ. Research* [1913], pp. 16, pl. 1, figs. 12).—This paper gives a general account of the structure of aphids and a brief discussion of their life history and habits, lists a few of the more important destructive species, gives method of treatment, etc.

On the production by the grape phylloxera of inverted galls on the leaves of *Vitis berlandieri*, F. PICARD (*Compt. Rend. Soc. Biol. [Paris]*, 73 (1912), No. 34, pp. 559-561; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 1, pp. 18, 19).—A report of studies made at the School of Agriculture at Montpellier.

The sugar cane mealy bug in Costa Rica (*Bol. Fomento [Costa Rica]*, 2 (1912), No. 7, pp. 466-469, figs. 2; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 1, pp. 20, 21).—*Pseudococcus sacchari* is reported to be rapidly spreading in Costa Rica and active measures are being taken in combating it.

The control of the Japanese fruit scale (*Diaspis pentagona*) in Italy, A. BERLESE (*Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 5, pp. 697-703).—A somewhat detailed discussion of the control of the West Indian peach scale by *Prospaltella berlesii*. A bibliographical list of 23 articles relating to its control in Italy that were published from September, 1912, to April, 1913, is appended.

The Florida fern caterpillar (*Eriopus floridensis*), F. H. CHITTENDEN (*U. S. Dept. Agr., Bur. Ent. Bul.* 125, pp. 11, fig. 1).—This insect has made its appearance within recent years in northern greenhouses, notably in the District of Columbia, in Illinois, and in Ohio, and has become a source of injury. It is apparently restricted to ferns, which appear to be its natural food plant in the South, and has undoubtedly been introduced into northern greenhouses in ferns from Florida. "It is a comparatively large and conspicuous species of caterpillar and, though not closely related to the true cutworms, has the same habit as cutworms of cutting or severing portions of the fern plants, apparently destroying more than it requires for food."

In this paper the author has brought together the present knowledge of the pest, including technical descriptions of its stages, distribution, injuries and habits, natural enemies, and methods of control. Two ichneumonid parasites, *Ichneumon extrematis* and *Sargaritis* sp., and an undetermined tachnid have been reared from this species.

As regards remedial measures hand picking has thus far given the best results since arsenate of lead, used in a strength sufficient to kill the caterpillars, appears to leave a white deposit on the plants, and hellebore scalded the foliage.

An unusual parsnip pest, J. W. H. HARRISON (*Entomologist*, 46 (1913), No. 597, pp. 58, 59).—*Depressaria heracliana* is reported to have been the source of considerable damage to seeding parsnip plants at North Durham during 1912. The flowers and immature seeds were spun together in huge masses through which silk-lined tunnels passed in all directions. In many cases the plants were killed before the seed was produced.

The silkworm, E. FAUCHÈRE (*Bul. Écon. Gouv. Gén. Madagascar*, 13 (1913), I, No. 1, pp. 92–111; abs. in *Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 8, pp. 286, 287).—This is a discussion of the silkworm as related to Madagascar and Réunion, including rearing methods, diseases, etc.

It is pointed out that monovoltine breeds of silkworm (*Bombyx mori*) when introduced into Madagascar become polyvoltine after a certain time and that, vice versa, polyvoltine strains introduced into Europe become monovoltine. Results obtained in the interior of these islands indicate that acclimatized strains produce 5 or 6 generations annually when properly cared for, and produce silk of a quantity and quality equal to that obtained from French silkworms. *Berocera madagascariensis* is attacked by a tachinid related to the oriental silkworm parasite.

On a bacillary septicemia of caterpillars of *Arctia caja*, F. PICARD and G. R. BLANC (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 17, pp. 1334–1336).—The caterpillars of this moth, which were extremely abundant in vineyards in the south of France in 1912, are said to have been largely destroyed by two diseases, one due to *Empusa aulicæ*, the other to a new coccobacillus (*Coccobacillus cajæ*) which is apparently allied to the species (*C. acridiorum*) found by d'Herelle to destroy locusts in Mexico (*E. S. R.*, 26, p. 246).

When the caterpillars ingest or are inoculated with *C. cajæ* they die at 25° C. in from 12 to 24 hours, or at 15° in about 3 days. The mortality which rapidly follows the ingestion of cultures of this organism suggests a practical application in combating this pest. The caterpillars of the brown-tail moth appear to be very susceptible to the infection, dying in from 24 to 48 hours following inoculation.

The rose slug caterpillar (*Euclea indetermina*), F. H. CHITTENDEN (*U. S. Dept. Agr., Bur. Ent. Bul.* 124, pp. 9, fig. 1).—This is a summarized account of the present knowledge of *E. indetermina*, which is a source of injury to the rose and young trees and shrubs. Arsenicals will control this insect.

New parasites of the cacao moth and parasites in general, W. ROEPKE (*Meded. Proefstat. Midden-Java*, 1912, No. 5, pp. 21, pl. 1; abs. in *Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 2, pp. 56, 57).—The author reports the discovery of 3 parasites of the cacao moth (*Acrocercops cramerella*) in cacao plantations in Assinan. Previous to this time no parasites were known to attack this pest.

The potato-tuber moth, F. H. CHITTENDEN (*U. S. Dept. Agr., Farmers' Bul.* 557, pp. 7, figs. 4).—This is a revised and amplified account, based on Circular 162 of the Bureau of Entomology (*E. S. R.*, 28, p. 355).

[The potato tuber moth in Victoria], G. SEYMOUR (*Jour. Dept. Agr. Victoria*, 11 (1913), No. 3, pp. 172, 173, figs. 2).—During 1911–12 the injury by the potato

tuber moth to the midseason crop in Victoria in some cases amounted to 50 per cent. The use of tarred canvas screens to trap the moth when on the wing and spraying with arsenical preparations are recommended. Deep planting; that is, to a depth of $5\frac{1}{2}$ to 6 in., is recommended, but of itself is not sufficient as it is a habit of some varieties to form their tubers near the surface. The best protection is thought to be furnished by fairly deep planting and thorough covering with soil.

A preliminary report of the temperature reached in army biscuits during baking, especially with reference to the destruction of the imported flour moth, *Ephestia kühniella*, J. H. DURBANT and W. W. O. BEVERIDGE (*Jour. Roy. Army Med. Corps*, 20 (1913), No. 6, pp. 615-634, pls. 7, figs. 5).—The investigations here reported were carried on to determine the source of infestation of ration biscuits exported to the British Colonies. A somewhat complicated thermo-electrical apparatus was used to determine the interior temperature of biscuits during the process of baking.

It was found that eggs of the Mediterranean flour moth which had been exposed to a temperature of 69° C. (156.2° F.) for 12 minutes failed to survive. As the temperature of the interior of the biscuit reached 100° C. the authors conclude that the infestation must take place after baking, during cooling, and prior to the soldering of the tins in which the biscuits are packed.

Leucoptera coffeella, an insect enemy of the coffee plant in Sao Paulo, Brazil, R. THERING (*Chacaras e Quintaes*, 6 (1912), No. 4, pp. 1-7; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 1, pp. 154-156).—This tineid is reported to have been the source of loss of about 35 per cent of the coffee crop in the State of Sao Paulo, the whole crop on some plantations being destroyed.

The species of *Anopheles* that transmit human malaria, F. KNAB (*Amer. Jour. Trop. Diseases and Prev. Med.*, 1 (1913), Nos. 1, pp. 33-43; 3, p. 227).—A summarized account. Of 34 species now known to occur in the Western Hemisphere only 8 have been definitely proved malaria transmitters.

The breeding places of *Phlebotomus*, F. M. HOWLETT (*Jour. Trop. Med. and Hyg. [London]*, 16 (1913), No. 16, pp. 255, 256).—A general discussion of the habits of sand-flies.

The host of verruga, C. H. T. TOWNSEND (*Reprint from Peru Today*, 5 (1913), July, pp. 840-842, figs. 2).—The author presents further evidence to show that sand-flies, dipterous insects of the genus *Phlebotomus*, are the carriers of verruga and that ticks are not, as was previously thought to be the case (*E. S. R.*, 29, p. 262).

Further observations on the parasites of *Simulium* larvæ, E. H. STRICKLAND (*Jour. Morph.*, 24 (1913), No. 1, pp. 43-94, pls. 6; *abs. in Rev. Appl. Ent.*, 1 (1913), *Scr. B*, No. 5, pp. 77, 78).—A report of investigations conducted in continuation of those previously noted (*E. S. R.*, 27, p. 456).

Three distinct classes of parasites are found in the vicinity of Boston, each of which causes the death of larvæ of *Simulium* species, namely, (1) parasites of the spring brood of *Simulium*, of which various Myxosporidia cause a mortality of 80 per cent; (2) a species of *Mermis*, affecting 25 per cent; and (3) parasites of the autumn brood, including 3 species of *Glugea*, one rare and the others causing from 5 to 10 per cent mortality, and a species of *Gregarina* causing up to 50 per cent mortality.

Warble flies (*Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 2, pp. 248-255).—This review of the recent literature on the subject follows a bibliography of 32 titles.

The sheep botfly or head maggot (*Æstrus ovis*), J. R. SERRES (*Gac. Rural [Buenos Aires]*, 6 (1913), No. 69, pp. 759, 761; *abs. in Rev. Appl. Ent.*, 1 (1913),

Ser. B, No. 8, p. 148).—An account of this pest, which is well known in Argentina, its life history, and the disease which it causes in sheep.

The serpentine leaf miner, F. M. WEBSTER and T. H. PARKS (*U. S. Dept. Agr. Jour. Agr. Research, 1 (1913), No. 1, pp. 59-88, pl. 1, figs. 17*).—The serpentine leaf miner (*Agromyza pusilla*), a dipteran generally distributed over the United States and having a wide range of food plants, is a source of injury to foliage through the burrowing of the larvæ between the membranes of the leaf and devouring the parenchyma.

"The injury takes the form of a serpentine 'mine' which encircles the leaf, gradually widening as the larva increases in size. Leaves of white clover and frequently of young alfalfa often have the entire cellular tissue devoured, leaving only the 2 membranes. There is usually only 1 larva present in each leaf. The injury from this insect is greatest in the Southwest, where the discolored leaves, which in severe cases become brown, are sometimes present in sufficient numbers to lower the quality and grade of the hay. The injured leaves can be found in the fields from May until November, the larvæ continuing to feed until killed by frosts. In Florida the larvæ continue feeding throughout the winter.

"The insect hibernates in the puparia beneath the surface of the soil at the base of the plants. There are 5 or 6 generations in latitude 41°, the number varying with the length of the growing season. The generations overlap to such an extent that all stages can be found in the fields during most of the season. During the period of highest temperature in summer the larvæ are found usually infesting plants protected from the direct rays of the sun. During this period in the arid Southwest the insect almost completely disappears from the fields, reappearing in September. The eggs are deposited in the leaf tissue and inserted in punctures identical with those made by the adult in feeding. The egg stage during June is 4 days. The larvæ feed continuously day and night and confine their work to a single leaf. The larval period during June is 4 days. In the Eastern States pupation occurs entirely in the soil. It takes place commonly in the larval chambers in the leaf in the arid Western States. The pupal period during June is 10 days. The average period of the complete life cycle is 23 days.

"Besides alfalfa the following field crops are subject to attack: Clover, cow-peas, rape, and cotton. A few nearly related and very similar leaf miners are known to attack timothy, wheat, oats, and grasses. When these crops are affected, the mine usually extends the entire width of the leaf, and may kill the plant if it is very young."

Some 28 hymenopterous parasites, of which *Diaulinus begini* is the most important, attack and consume the larvæ and pupæ within their mines. These are highly efficient and serve to keep the insect in control. The efficiency of the parasites decreased upon the approach of cool weather. Many of these parasites are functional in the control of more than one species of leaf miner, and are very widely distributed. Frequent cutting of alfalfa kills the larvæ in the leaves and does much to protect this crop. This method should be followed where the injury becomes serious. Deep fall or winter plowing is advocated for annual forage crops and cereals in order to bury deeply the hibernating puparia located near the surface of the ground."

A bibliography of 10 titles is appended.

A serious pest of *Coffea arabica* in Belgian Kongo, R. MAYNÉ (*Bul. Agr. Congo Belge, 3 (1912), No. 4, pp. 911-917, figs. 5; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 1, pp. 22-24; Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 3, pp. 492, 493*).—A longicorn beetle

which attacks the trunk of the tree just above the ground is one of the principal causes of serious reduction in the yield of coffee.

Root borers and other grubs in West Indian soils (*Agr. News* [Barbados], 12 (1913), Nos. 289, pp. 170, 171; 290, p. 186).—A continuation of the article previously noted (E. S. R., 28, p. 858).

Beetles affecting the coconut palm, F. W. URICH (*Proc. Agr. Soc. Trinidad and Tobago*, 13 (1913), No. 4, pp. 164-167).—This account relates to the grugru beetle (*Rhynchophorus palmarum*), the bearded weevil (*Rhina barbirostris*), a rhinoceros beetle (*Strategus alveus*), a shot-hole borer (*Xyleborus* sp.), two weevil borers (*Metamasius obsoletus* and *M. hemipterus*), and the coconut scale (*Aspidiotus destructor*). An undetermined tachinid fly is said to have been reared from the bearded weevil, and the larvæ of the histierid beetle *Orysternus maximus* prey upon the larvæ of the grugru beetle.

An insect causing serious injury to vineyards (*Rev. Inst. Agr. Catalán San Isidro*, 62 (1913), No. 2, pp. 23-26; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 6, pp. 189-191).—The larvæ of the cerambycid beetle *Vesperus watarti* are reported to have seriously injured vineyards in Spain.

Report on *Phytalus smithi* and other beetles injurious to the sugar cane in Mauritius, D. d'EMMEBEZ DE CHARMOY (*Port Louis, Mauritius: Govt.*, 1912, pp. 35, pls. 9).—The first part (pp. 1-24) of this report relates to the life history, natural enemies, and methods of combating *P. smithi*, which has been the source of serious damage to sugar cane. The second part (pp. 25-34) presents general information on beetles living at cane roots, including *Adoretus versutus*, which is one of the commonest beetles in the island, and is a regular pest attacking all trees, cultivated or wild; *A. compressus*, which is less common than the first mentioned species; *Serica* n. sp.; *Oryctes tarandus* and *O. insularis*, the different species of which genus have been known for years in Mauritius under the name of "moutoucs;" *Gymnogaster buphthalma*; *Agrypnus fuscipes*; the tenebrionids, *Eutochia fullo* and *Opatrum crenatum*; and the curculionids, *Cratopus punctum* and *Trocarocephalus strangulatus*. The third part (p. 35) consists of a list of 14 species of other insects attacking the sugar cane in Mauritius.

Injury caused by *Criocephalus rusticus* to building timber, C. HOULBERT (*Insecta*, 2 (1912), No. 24, pp. 302-310, pl. 1, figs. 6; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 2, pp. 42, 43).—Ordinary fir timber is said to have been seriously damaged by this longicorn beetle in the Department of Ille-et-Vilaine, France. In some cases the beetles appeared to have emerged by piercing plates of zinc. The timbers were reduced to a mere shell and in some cases the insect bored through the solder which had been used to repair nail holes in the zinc plates.

Corn injury by wireworms (*Agriotes lineatus*) in Bessarabia, G. KOSLOVSKII (*Khozâistvo*, 7 (1912), No. 30, pp. 1000, 1001; *abs. in Internat. Inst. Agr.* [Rome], *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 10, p. 2316).—The greatest damage is said to have occurred on land where corn was grown during the previous year. In fields following potatoes, sorghum, barley, and soy beans, the injury to corn by wireworms was very slight.

Investigations of the fungus-growing fruit tree bark beetle *Xyleborus* (*Anisandrus*) *dispar* and its food fungus, O. SCHNEIDER-ORELLI (*Centbl. Bakt. [etc.]*, 2. Abt., 38 (1913), No. 1-6, pp. 25-110, pls. 3, figs. 7; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 8, pp. 259-261).—This is a detailed report of a study of the bionomics of the scolytid beetle *X. dispar* and contains the results of numerous experiments regarding its feeding habits. The experimental propagation of its food fungus *Monilia candida* is also discussed.

Tables for the identification of the bark beetles (Scolytidae) of Europe and adjacent countries, E. REITTER (*Wiener Ent. Ztg.*, 32 (1913), *Beiheft*, May 15, pp. 116).—This is a key to more than 360 species, with notes on their habits.

Investigations pertaining to Texas bee keeping (*Texas Sta. Bul.* 158, pp. 5-43, pls. 8, fig. 1).—This bulletin consists of 3 separate papers.

I. *Experiments in artificial divisions and swarm control*, W. Newell (pp. 5-14).—The experiments here reported, which were carried on during the season of 1912 in an apiary of 60 colonies in Brazos County, were made, first, to test different manipulations in their effect in discouraging or retarding swarming, and incidentally their effect upon honey production; and, secondly, to determine the comparative production of honey by both the Italian and Carniolan colonies, kept in the same yard and under the same conditions. The investigations show a gain of \$2.09 in favor of the divided colony where the new colony was figured at a value of \$3. In the case of 10 colonies which received an increase of 50 per cent in the capacity of the brood chamber prior to the development of the swarming impulse, 3 did not swarm at all and in the 7 others, swarming was apparently delayed from 2 to 3 weeks. In no case did the abundant super-room have any perceptible effect upon the swarming tendency.

The average production of a small number of Carniolan colonies, namely, 103 lbs. per colony, was exactly the average production of all colonies, Carniolans, Italians, and hybrids, in the apiary.

II. *The life history and control of the bee moth or wax worm*, F. B. Paddock (pp. 15-30).—The dissemination of the bee moth (*Galleria mellonella*) is said to have been complete in Texas, there being but few counties in the State where bees are kept that are free from the pest at the present time. In reporting for the year 1911, 136 bee keepers recorded losses of their colonies varying from 5 to as high as 95 per cent.

Investigations indicate that there are 3 broods of this pest in the extreme southern part of the United States, but since there is a decided overlapping of the generations, it is difficult to determine the exact number of broods a year. The winter is usually passed with about one-third of the insects in the pupal stage and the remainder in the larval stage. The moths may emerge during warm spells in the winter and in protected places can survive an outside temperature as low as 26° F. for as long as 5 days. At College Station, where the life history and duration of the broods have been carefully determined, the maximum number of moths which mature from the overwintering larvæ and pupæ appear about the first of April. "These moths are active for some time before any eggs are deposited and it is the middle of April before the eggs are laid for the first brood of larvæ. Usually 12 days are required for the eggs of this brood to hatch, so by the first of May most of the first brood of larvæ are out. The larval period of this brood is quite long, most of them feeding at least 45 days before completing their growth. A majority of the larvæ of the generation are ready to pupate by the middle of June, but there is a considerable variation in the rate of growth, for some of these larvæ feed for 6 weeks longer before attaining their full size. The pupation of the first brood takes place during the last 2 weeks in June and by July 1 some of the moths of the second generation are to be seen. The moths of this generation emerge at about the same time and give the impression of constituting a very large brood. Most of the eggs are laid very soon after emergence of the moths and by the middle of July all of the eggs of the second generation are deposited. The higher temperature at this time of the year shortens the egg period, only 10 days being required for these eggs to hatch. There is a considerable variation in the maturing of this brood of larvæ. Normally the larval period is shorter than for the first

brood and by the first of September many of the larvæ are full grown. Some of the larvæ may continue to feed for 4 weeks longer and then pupate.

"Some of the larvæ which mature early in September may pass through a short larval stage and soon emerge as moths. This accounts for the appearance of a number of moths about the first of October. This brood is usually small and scattered and many of the larvæ which result from the eggs of these moths seldom reach full size." It is stated that 1,128 is the largest number of eggs found in the ovaries of a single female, the average number being 1,014.

Under the discussion of natural enemies the author reports that a small red ant (*Solenopsis* sp.) has been found to be an enemy of the bee moth, in cage experiments many of the pests, both moths and larvæ, having been destroyed by it. Fumigation experiments with infested combs indicate that sulphur fumes are not ordinarily penetrating enough to affect the eggs and that only when the larvæ are young and not well protected will the gas affect them. In experiments with carbon bisulphid eggs of the bee moth were uninjured but the larvæ were destroyed and the pupæ and moths found to be quite susceptible, although a long exposure of the pupæ to the fumes is necessary. "All fumigation should be allowed to continue for at least 12 hours, for those larvæ which are best protected by webs and refuse will not be killed unless plenty of time is given for the gas to penetrate the material."

III. *A statistical study of Texas bee keeping*, W. H. DEAN (pp. 31-43).—This paper is based upon a questionnaire in which 2,733 reports for the year 1911 were received. Detailed tables are given which show by counties a total of 90,770 hives with a value of \$434,124, and an average production of 26 lbs. The opinions of bee keepers as to the most profitable scale on which apiculture may be pursued were in general accordance with their own practices. Data are also summarized as to wax production, prices, etc.

Mendelian methods applied to apiculture, F. W. L. SLADEN (*Canad. Bee Jour.*, 20 (1912), No. 12, pp. 357-367, fig. 1; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 2, pp. 276-279).—This is a study of the color patterns of bees, explaining the evident segregation of golden, intermediate, and black characters as an evidence of Mendelian inheritance.

The proportion of the 3 forms varied in different cases but the intermediates were usually in excess of golden and black. A conclusion of practical value is that the union of a golden queen and a black drone (both homozygous) produces a greater proportion of intermediates than where intermediates (heterozygous) are united. These intermediates possess desirable qualities. The workers are more vigorous, hardy, and industrious; they are larger, and their temper is usually good.

The question is raised as to whether all drones are produced parthenogenetically. It is believed that this is not always the case. The case is cited in which golden queens produced golden and intermediate drones. Had the drones been produced parthenogenetically, they would have received only the pure gametes for the golden character from the queen, and hence the intermediates would have been impossible.

Biological and embryological studies on Formicidæ, M. C. TANQUARY (*Bul. Ill. State Lab. Nat. Hist.*, 9 (1913), Art. 9, pp. 417-479, pls. 8, fig. 1).—Three papers are here presented, the first dealing with the life history of the corn field ant (*Lasius niger americanus*) (pp. 417-443); the second with experiments on the trail formation and orientation of the common house ant, *Monomorium pharaonis* (pp. 443-453); and the third with studies on the embryology of *Camponotus herculeanus ferrugineus* and *Myrmica scabrinodis sabuleti* (pp.

454-479). A list of the literature cited, consisting of 19 titles, is appended to the paper.

An unrecorded apple sawfly in Britain (*Lygæonematus mæstus*), F. V. THEOBALD (*Entomologist*, 46 (1913), No. 598, pp. 108, 109).—The larvæ of this sawfly were received during 1911 and 1912 from 2 places in Hampshire, and from Berkshire, where they were found feeding on apple foliage. A small colony was also said to have been found by the author at Wye in 1907. At the localities in Hampshire they were the source of much damage through stripping the trees.

Spider's web and malaria, F. KNAB (*Jour. Trop. Med. and Hyg.* [London], 16 (1913), No. 9, pp. 133, 134).—The author reports observations to show that *Anopheles quadrimaculatus*, which in the northern United States is the principal malaria transmitter and over a large area practically the only one, is not entangled in spider webs, though it frequents them as resting places.

The biology of some North American ticks of the genus *Dermacentor*, F. C. BISHOPP and H. P. WOOD (*Parasitology*, 6 (1913), No. 2, pp. 153-187, pls. 3, fig. 1).—The life histories of 3 species are here dealt with, namely *D. hunteri*, *D. albipictus*, and *D. nigrolineatus*.

FOODS—HUMAN NUTRITION.

Mineral and organic analyses of foods, E. B. FORBES, F. M. BEEGLE, and J. E. MENSCHING (*Ohio Sta. Bul.* 255, pp. 211-232).—New methods for the determination of sodium and crude fiber are described, as noted on page 807, and ash analyses of foods and feeding stuffs reported, including cereal products such as wheats differently fertilized, wheat by-products, corn, bolted corn meal, corn bran, oats, Kafir corn, hominy, rice, rice polish, gluten feeds, distiller's and brewer's grains, and malt sprouts; fruits, including apples, prunes, bananas, and dates; vegetables, including onions, cabbage, potatoes, sweet potatoes, and mangels; hay, including clover, soy beans, cowpeas, alfalfa, timothy, and millet, also corn stover, blue grass, and wheat straw; leguminous seeds, including soy beans, navy beans, cowpeas, and peanuts; and concentrates, such as linseed oil meal, cotton-seed meal, skim milk, whey, mutton, eggs, tankage, and other animal products; and agar agar.

In discussing the analyses of the various groups at length, the authors call attention to the fact that "the inorganic products vary remarkably in accord with the conditions of growth, especially as relating to soil, rainfall, and sunshine, and also rapidity of growth and stage of maturity attained. . . . The general character only of the ash analysis of a vegetable product remains characteristic."

"Considering the cereals and cereal products as a group, we observe that from the point of view of this discussion the dominant characteristic which they have in common is the lack of lime. The acid mineral elements slightly and rather uniformly exceed the basic elements, and the phosphorus is almost wholly organic. Wheat bran, wheat middlings, red dog flour, and rice polish are remarkable because of high phosphorus contents, which would be an advantage in rations containing the calcium necessary to the utilization of the phosphorus.

"Considering the cereal products as human foods, the greater acceptability of the highly milled products is attained at a considerable loss of mineral nutriment, and the use of these modern products requires more careful consideration of the remainder of the diet than was necessary in the days of primitive milling processes.

"Growing animals subsisting on cereals alone soon come to suffer from malnutrition of the bones."

"Leguminous seeds . . . have very high feeding values; the range of their usefulness is wide, and is being rapidly extended. On the mineral side they are qualified to some extent to supplement the cereals, because of an excess of basic over acid mineral elements, and greater contents of calcium, but they possess both of these qualities in smaller measure than the roughages of the same species. . . .

"[Milk] is characterized by an excess of basic over acid mineral elements, and contains considerably more calcium than phosphorus, and generous amounts of both of these, on the dry matter basis. Its phosphorus is a little more largely in inorganic than in organic compounds.

"Whey contains a greater proportion of basic to acid mineral elements than does milk, since the curd removes more acid than basic mineral elements from milk. The ready assimilability of its organic constituents, and the corrective tendency of its minerals in the various digestive disturbances of infancy, especially those in which acidosis is a feature, make whey the rational basis for the modification of milk for infants. . . . The use of whey rather than water in the modification of milk [is recommended]. Whey is also especially useful in severe illness of older children. . . .

"Meat, like the cereals, is extremely low in calcium, and like them, will cause malnutrition of the bones if used to the exclusion of other foods. Carnivorous animals naturally make good this deficiency by eating bones. . . .

"Eggs are also low in calcium, a deficiency which the incubating chick makes good by withdrawing calcium carbonate from the shell. Eggs are rich in phosphorus, however, in organic compounds, mostly lecithin, which has a high nutritive value, and which is a universal cell constituent.

"Considering the animal products as a group, they usually contain an abundance of phosphorus, but only milk and bone preparations contain enough calcium to make them of value on this account in supplementing the cereals. . . .

"Fruits and vegetables . . . have in common a very decided preponderance of basic over acid mineral nutrients, due largely to high potassium and low phosphorus contents, the bases being present as salts of organic acids which are oxidized in the body, the acid radicle being excreted as carbon dioxide and water, and the inorganic bases becoming free for the neutralization of mineral acids which can not thus be oxidized to harmless products. This fits them admirably to serve as supplements to the cereals and leguminous seeds. They are, on the dry basis, moderately rich in calcium."

From the work as a whole, the following conclusions are drawn:

"All things considered, then, the ration which is most likely to contain in abundance all of the mineral nutrients required by animals, is one characterized by diversity of origin, no one class of foods greatly exceeding others. . . .

"Grouping together the foods with acid ash—cereals, meats, and eggs, and opposing to them those of alkaline ash—fruits, vegetables, milk, and legumes, the latter group should be liberally represented in the dietary.

"Among single foods, milk and the legumes are perhaps more nearly complete foods on the mineral side than others, though there are many reasons why extreme simplicity of diet is not advantageous.

"Those circumstances most likely to lead to error in this matter of the mineral elements in nutrition are poverty, parsimony, fads, and indifference."

Interim report on the supply and distribution of meat. Royal commission [of New South Wales] of inquiry as to food supplies and prices, T. R. BAVIN ET AL. (*Sydney, N. S. W.: Govt., 1913, pp. LXVIII+297*).—Data regard-

ing the organization of the commission and the scope of its work and a summary of its findings and recommendations are included, as well as other similar data and the full minutes of evidence. Appendixes contain articles on American beef trusts, wholesale prices at Sydney, Melbourne, and Brisbane, and the grading and sale of meat at Marseille.

Better transportation facilities, resting stock before slaughtering, better abattoirs, centralizing the authority for the inspection of slaughterhouses and carcasses, and grading at the abattoirs all the meat for local consumption into such classes as may be deemed desirable and stamping with marks indicating the grade are among the recommendations. The commission further recommends that the authority controlling the meat trade take into consideration the advisability of adapting the system of limiting the sale of meat by retail butchers to those grades which they declare their intention of selling. They also recommend that the inspection of butcher shops and the control of their sanitation and supervision be placed in the hands of the central authority, and that this authority be empowered to open stalls for the retail sale of meat, if for any exceptional reason it be deemed desirable to take this course.

"We find, so far as the meat trade is concerned, that no sufficient statistics are available to enable the student of economic problems to pursue an exhaustive investigation; furthermore, the bookkeeping methods of most of the firms engaged in the trade are not such as to allow of this information being furnished. We recommend that full and complete statistics relating to prices and wages in the meat trade be kept and tabulated by the statistician's department, and that power be given that department to require from the firms engaged in the trade such data as may be necessary for the purpose."

Composition and judgment of sausages, E. AVÉ-LALLEMANT (*Arch. Hyg.*, 80 (1913), No. 1-6, pp. 154-168).—Analytical data are given for a number of varieties of sausage, and methods of analysis are discussed.

The presence of some organic bases in dried herring roe, K. YOSHIMURA (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 86 (1913), No. 2, pp. 174-177).—Cholin and trimethylamin were isolated from dried herring roe.

Cheese as a food and its judgment from the standpoint of the food chemist, R. REICH (*Arch. Hyg.*, 80 (1913), No. 1-6, pp. 169-195).—Analytical and general data are given regarding several kinds of cheese, including schweitzer, Edam, Tilsit, Camembert, Brie, Neufchatel, and Limburger.

The influence of germination on the milling qualities of wheat, C. O. SWANSON (*Oper. Miller*, 18 (1913), Nos. 2, pp. 98-100, figs. 4; 3, pp. 165-167, figs. 4; 4, pp. 225-227, figs. 3; 5, pp. 293, 294, figs. 2; 6, pp. 365-368, figs. 7).—Milling and baking tests were carried out upon several samples of wheat which had been allowed to germinate for periods of 1 to 6 days.

A loss in weight of the different wheats during germination and scouring was noticed, which loss increased with the length of the period of germination. The yield of flour was poorer according to the length of germination, but germination for 1 or 2 days had no deleterious effect. It was noticed that the dough made with the flour from wheat germinated 3 to 5 days had a rubbery consistency while working and became more brittle after standing than that from sound wheat, while the loaves exhibited a poorer texture and a weaker gluten according to the length of germination. An increase in the percentage of amino-acid compounds was noticed in the flours from the germinated wheat, due to the decomposition of the protein during the process of germination.

In one experiment the germinated wheat was milled without being scoured. Bread made entirely with flour from this wheat was of a very poor quality. The addition of even a small amount of this flour to flour made from sound

wheat made the dough sticky and very difficult to handle, and gave the loaves a very poor texture.

To determine whether or not the harmful constituents of the germinated wheat were contained in the bran or the kernel of the wheat, cold water extracts of both the bran and shorts from sound and germinated wheats were added to dough made of flour from sound wheat. The results obtained in these experiments showed that the substances in the germinated wheat which gave poor results in the baking tests were present to a very large extent in the materials ordinarily removed in the process of scouring.

Relation of the composition of flour to baking quality, C. H. BAILEY (*Canad. Miller and Cerealists*, 5 (1913), No. 9, pp. 208, 209, fig. 1).—Data are given concerning the relation of percentages of crude protein and ash in the flour to its baking strength, and the relation of the ash and acidity of the flour to the color of the bread baked therefrom. It was observed in general that bread baked from flours having a high percentage of ash and acidity had a darker color than bread baked from flours of lower ash and acidity.

Studies on the fermentation of bread, A. J. J. VANDEVELDE ET AL. (*Rev. Gén. Chim.*, 16 (1913), Nos. 4, pp. 53-61; 5, pp. 86-95; 7, pp. 123-130; 8, pp. 136-141).—These studies were made to determine the influence of various chemical and physical agents upon the fermentation of bread and upon gluten.

The method of preparation was one in which no acid leaven was used, pressed yeast being added to a dough of wheat flour, water, and salt. A method for the determination of the activity of the yeast is described as well as one for the estimation of the qualities of the bread. The qualities measured were the density, water content, and rapidity of drying at ordinary temperature.

In the study of the gluten, dry heat, and especially moist heat, were found to reduce or to destroy completely the elastic properties of the gluten in the flour, although drying without heat had no deleterious effects. Neutral salts, such as sodium chlorid and the sulphates of sodium, ammonium, and magnesium reduced or destroyed the elastic properties of gluten, and consequently hindered its formation. A study of the diffusion of various salts in gluten was made as well as of the effect upon the gluten of solid organic acids and of certain organic substances, like casein, albumin, and peptone.

Fermentation was favorably influenced by phosphoric, acetic, and succinic acids and inhibited by hydrochloric, nitric, sulphuric, and oxalic acids. Lactic, tartaric, and citric acids had no appreciable effect. Of the carbohydrates, starch and dextrin were found to retard fermentation; saccharose and glucose, while they retarded fermentation at the beginning in strong concentrations, gave an increased fermentation after 24 hours. The density of the bread was found to be proportional to the gluten content. The various auxiliary products, especially diastatic and lactic preparations, which were intended to assist fermentation, were found to be slightly beneficial. The diastatic preparations increased the amount of fermented sugar, while the lactic preparations increased the acidity of the dough.

The fats of milk were found to have little effect. Milk sugar had a favorable action, while casein and mixtures containing casein were unfavorable. Small quantities of milk appeared to favor fermentation on account of the presence of lactose.

Digestion experiments with army bread, G. LEBBIN (*Ztschr. Untersuch. Nahr. u. Genussmitl.*, 26 (1913), No. 2, p. 109).—Experimental data are given but not discussed.

Use of corn, Kafir, and cowpeas in the home, C. F. LANGWORTHY and CAROLINE L. HUNT (*U. S. Dept. Agr., Farmers' Bul.* 559, pp. 12).—The nutritive value and use in the diet of corn, Kafir corn, and cowpeas are discussed and a

number of recipes given for their preparation for the table which were studied experimentally.

A chemical investigation of Asiatic rice, A. S. CUSHMAN and H. C. FULLER (*Trans. Amer. Inst. Chem. Engin.*, 5 (1912), pp. 70-77).—This paper presents results previously noted from another source (E. S. R., 28, p. 360).

Rice as a food (*Bol. Agr. [Sao Paulo]*, 14. ser., 1913, No. 3, pp. 145-159).—Data are given regarding the nutritive value of rice, studies being made of the amounts of protein, carbohydrate, and mineral matter. A comparison is made of the rice with other foods, and the medicinal value of rice flour is discussed. Data are also given regarding the extent of consumption of rice in various countries.

Polyn neuritis gallinarum caused by different foodstuffs, with special reference to the effect of commercial rice coating on nephritis production, C. WELLMAN and C. C. BASS (*Amer. Jour. Trop. Diseases and Prev. Med.*, 1 (1913), No. 2, pp. 129-139, pls. 3).—The authors find that "glucose and talc, when fed together or separately, do not produce polyn neuritis gallinarum in birds receiving a diet which does not itself produce the disease. Glucose and talc in large amounts do not prevent prompt recovery from polyn neuritis gallinarum. Polyn neuritis gallinarum can be produced by feeding milled rice and many other food substances which have neither glucose nor talc on them. Glucose and talc, therefore, play no part in the production of polyn neuritis gallinarum which results from an exclusive diet of 'polished' rice."

They believe further that their experiments indicate that neither legislation nor regulations against the sale of polished rice, based upon the fact that the exclusive feeding of it produces polyn neuritis in fowls, is warranted.

Pigeons and chickens were used in these tests. Milled rice, raw and boiled, boiled sweet and Irish potatoes, corn grits, cornstarch, macaroni, sago, wheat flour, a wheat breakfast food, and a rice breakfast food were used.

The data secured indicate that several other articles of diet produced polyn neuritis as certainly as either polished or unpolished rice and in three instances the disease was more quickly induced.

The soy bean, L. GRANATO (*Bol. Agr. [Sao Paulo]*, 14. ser., 1913, No. 3, pp. 159-167, figs. 3).—Data are given regarding the botanical characteristics, the composition and food value, and the uses of the soy bean.

Concerning the nutritive value of edible fungi, O. VON HELLENS (*Finska Läkarsällsk. Handl.*, 55 (1913), pp. 408-434; *abs. in Zentbl. Biochem. u. Biophys.*, 15 (1913), No. 12-13, p. 483).—Digestion experiments with man in which from 1,250 to 2,557 gm. of a mixture of four different sorts of Boletus were eaten showed that 62.66 per cent of the total matter, 42.85 per cent of the protein, and 81.16 per cent of the nitrogen-free extract were retained in the body, as well as 52.01 per cent of the total energy value.

The author points out that the fungi had about the same nutritive value as cabbage, lettuce, etc., and so are worth using in quantity in the diet, especially in Finland where the diet of the country people is much too monotonous.

The judgment of fruit products, F. HÄRTEL (*Arch. Hyg.*, 80 (1913), No. 1-6, pp. 228-249).—Adulteration and methods of analysis are discussed, especial attention being given to marmalades.

[Food analyses and other pure food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 2 (1913), Nos. 17, pp. 277-288; 18, pp. 293-304, 311-324, figs. 3; 19, pp. 325-331, 340).—A number of topics are discussed, including in the first publication, among others, gelatin or gum in ice cream, benzoate of soda, and responsibility for the use of canned food prepared from a product unfit for use. Analyses of miscellaneous foodstuffs and

mineral water are given. A special study of commercial graham flours by R. E. Remington (pp. 285-288) is reported. He concludes that the "graham flours" on the market are "(1) whole wheat flour made by one grinding from the entire wheat kernel, either on a burr mill or a roller mill; (2) whole wheat flour to which has been added some bolted flour, either with or without partial removal of the bran, apparently for the purpose of making a lighter colored and more salable product; (3) a mixture of some of the different streams in the usual process of milling, in order to work off the less salable and cheaper products; (4) a mixture of bolted flour with bran or shorts made in a jobbing house or outside the mill."

The second publication discusses albumin in baking powder; describes what the author considers a misleading test of such baking powders in comparison with other sorts; gives some general data regarding miscellaneous topics, including cold storage provisions and the adulteration of leather; reports data regarding so-called "disinfectants," a drug product, paints, and miscellaneous foodstuffs; and gives the results of a study of the proportion of screenings in North Dakota grown wheats.

According to the data obtained, the screenings do not differ "very materially from the average in composition of wheat bran and middlings as found upon the market, and have about the same amount of protein as alfalfa hay and considerably more of carbohydrates in the form of nitrogen-free extract. All screenings, however, should be ground before being fed so as to be sure that the weed seed will not germinate. The samples reported . . . were found to be a mixture of broken wheat, flax, millet, pigweed, wild oats, hare's ear mustard, lamb's quarters, wild rose, corn cockle, wild buckwheat, and Indian mustard."

From a study of the effect of barley and rye on the milling and baking quality of wheat by T. Sanderson (pp. 312-314), the conclusion was reached that this is a matter which affects the manufacturer of flour more than the consumer, and that "there is no machinery yet devised and available by which the miller can separate these grains." The trouble is largely ascribed to "carelessness on the part of some one over whom the manufacturer has no control," so that "this practice should be rigidly dealt with in all cases until the producers feel that they can not afford to be careless in this matter."

In a report on baking powders, by R. E. Remington (pp. 314-323), the results of the examination of a number of samples of different types are presented, together with data regarding the probable end-products in the dough, and similar information.

Samples of baking powder were also examined for the presence of toxic metals. According to the author, it should be pointed out, in justice to the manufacturers, "that with one exception all samples showing more than 1 part per million of arsenic bore distinct evidences of being more than 1 year old, and the 2 samples which showed more than 5 parts per million of lead were several years old. All new stock, with one exception, has been found to be free from more than mere traces of these injurious metals. The consumer who buys only well known brands, and insists that the stock be fresh, has little to fear on this score."

The North Dakota baking powder ruling is quoted.

The third publication discusses the baking powder situation, particularly albumin in baking powders; records some corrections in the baking powder analyses reported in the preceding bulletin (No. 18); and reports analyses of tobacco, snuff, and a drug product.

[Food inspection and other topics], J. H. WALLIS and C. D. MASON (*Bien. Rpt. Idaho Dairy Food and Sanit. Insp. and State Chem.*, 5 (1911-12), pp. 234,

pls. 16, figs. 2).—The food standards in force in Idaho, data regarding the examination of a large number of samples of food and drugs, the results of sanitary inspection work, and other similar data are included in this report.

Preliminary report of the dairy and food commissioner for the year 1912, J. FOUST (*Penn. Dept. Agr. Bul. 240, 1913, pp. 56*).—Data are given regarding the examination of a large number of samples of dairy products and other food materials.

Analyses of confectioners' glucose, E. GUDEMAN (*Jour. Indus. and Engin. Chem., 5 (1913), No. 8, pp. 665-668, figs. 7*).—Curves are given showing the maximum, minimum, and average content of total ash, chlorids, sulphur dioxide, and copper in confectioners' glucose, as determined from an analysis of over 1,000 samples as purchased in the market.

"The fluctuation in the amounts of all ingredients is so large that none of them can be taken as indicating the quality of the product, and also shows that no fixed figures can be taken as standards for commercial glucose or corn sirup."

The possibility of adulterating salt with potassium salt rich in sodium chlorid, S. GOY (*Ztschr. Untersuch. Nahr. u. Genussmit., 26 (1913), No. 4, pp. 185-187*).—According to the data presented, salt containing potassium is used as an adulterant of table salt.

The potassium salt is regarded as harmful to health.

A new method of canning, KOCHS (*Konserv. Ztg., 14 (1913), No. 28, pp. 217, 218; Pure Products, 9 (1913), No. 9, pp. 440-443*).—The author calls attention to the fact that in the blanching of fruits and vegetables preparatory to canning, as ordinarily carried out by parboiling in water, large amounts of soluble constituents are lost, especially if the blanching water is thrown away as is usually the case. The substitution of steam at 4 lbs. pressure in the blanching process is recommended, since this decreases the time of cooking and greatly diminishes the loss of soluble constituents.

A description is given of a new method of canning which, it is claimed, will prevent the loss of nutrients and flavor of canned foods due to their extraction by osmosis through contact with the filling water. In this process a can is used which is provided with a perforated false bottom placed a short distance above the real bottom, the space between these two bottoms being filled with water. The space above the false bottom is filled with the goods which have previously been blanched by steam, and the can is sealed in the usual manner. During the processing of the cans the water boils and generates steam which cooks and sterilizes the contents of the can. On cooling, the steam condenses and runs back into the bottom of the can, thus reducing to a minimum the amount of water in the can. Care must be taken to keep the can in an upright position during the processing and cooling, to prevent the water coming in contact with the goods.

From a comparison of foods canned by this process with those canned by the older process, it is claimed that the former have a superior quality, and a chemical examination of these products showed a smaller loss of protein, sugar, and mineral substances.

Factors in the cost of living, F. W. BLACKMAR (*Quart. Rpt. Kans. Bd. Agr., 32 (1913), No. 125, pp. 47-58*).—Statistical and other data are presented in this discussion of the causes and prevention of the high cost of living.

[Marketing and the cost of living] (*N. Y. Dept. Agr. Bul. 35, 1912, pp. 875-1230, pls. 7*).—At the seventy-second annual meeting of the New York State Agricultural Society a number of papers were read upon the relation of marketing to the cost of living, among which were the following:

The Albany Public Market, by E. J. Marsden; the New York Food Investigating Commission, by W. C. Osborn; the Ability of the Consumer to Reduce the High Cost of Living by More Judicious Selection and Economy in Purchase of Foods, by I. S. Wile; Cooperative Buying and Selling as it Affects the Producer and Consumer, by W. N. Giles; the Cost-of-Living Problem, by W. J. Gaynor; the Canadian Fruit Marks Act, by J. A. Ruddick; Cooperative Marketing, by W. H. Ingling; the Producer and the Consumer, by A. P. Sandles; How a Knowledge of Food Values will Help the Housewife to Reduce the Cost of Living, by Mary D. S. Rose; Wholesale Buying by Neighborhood Clubs, by Mrs. B. Bangs; and the Housewife and the Cost of Living, by Martha Van Rensselaer.

Food waste and its remedy (*Institution Quart. [Ill.], 4 (1913), No. 2, pp. 86, 87*).—The possibilities of reducing waste in food in public institutions is discussed and brief notes given regarding the reduction of waste in the Kankakee State Hospital, which was noted when a plan previously outlined was followed (*E. S. R., 29, p. 463*).

A reduction of 21,000 lbs. in a month is reported from a kitchen serving about 1,200 patients. The employment of more supervisors who shall first receive intelligent and adequate instruction in dining room and diet service is favored "to the end that waste shall be reduced and that the food which does return to the kitchen shall be in such condition that it can be utilized in later meals.

"There is no economic question connected with our state institutions so important as that of food. It involves the use of as great a variety of food as is consistent with the proper dieting of patients and inmates; it involves the greatest possible variety of forms in which to serve food; it means the preparation of food so that it will be palatable; it means the serving of food so that it will be hot when it reaches the inmates; it involves finally the reduction of waste to a minimum."

The nutritive value of gelatin, F. MAIGNON (*Bul. Mens. Off. Renseig. Agr. [Paris], 12 (1913), No. 7, p. 813*).—It was found that animals, when fed upon a mixture of gelatin and fat, grew thin and died in from 1 to 2 months. From this the author concludes that gelatin is an incomplete protein food, sufficing to supply energy but not to renew protoplasm.

The function of fats and carbohydrates in nutrition, F. MAIGNON (*Bul. Mens. Off. Renseig. Agr. [Paris], 12 (1913), No. 7, p. 812*).—The author concludes from his experiments that egg albumin alone can not maintain nitrogen equilibrium, even though a mixture of albumin and fat does maintain such equilibrium. He has also shown, in his opinion, that carbohydrates can not replace fats in their function of assisting in the utilization of nitrogen.

He concludes that the fats possess a function which they do not share with any other substance. They control, and are indispensable to, the utilization of food nitrogen.

Carbohydrate metabolism in its relation to the thyroid gland—the effect of thyroid feeding on the glycogen content of the liver and on the nitrogen distribution in the urine, W. CRAMER and R. A. KRAUSE (*Proc. Roy. Soc. [London], Ser. B, 86 (1913), No. B 591, pp. 550-560*).—The relation of the thyroid secretion to metabolism, especially of carbohydrates, is discussed, and the results are presented of a series of experiments which were carried out to determine the effect of thyroid feeding on the glycogen content of the liver and on the general metabolism of carbohydrate and protein food. It was observed in these experiments that the liver of animals to which small amounts of fresh thyroid gland had been administered for 2 or 3 days contained only traces of glycogen, which phenomena the authors attribute to an inhibition of the glycogenic function of the liver rather than to an increased utilization of carbohydrates.

"The action of the thyroid secretion on protein metabolism is effected partly through its action on carbohydrate metabolism, for the distribution of the nitrogenous constituents of the urine after thyroid feeding is very similar to that observed after withdrawal of carbohydrates from the diet or in disturbances of carbohydrate metabolism."

The influence of protracted and intermittent fasting upon growth, S. MORGULIS (*Amer. Nat.*, 47 (1913), No. 560, pp. 477-487).—From experiments with laboratory animals, the results of which are presented and discussed, the author concludes "that periodic starvation is more detrimental to the organism than acute starvation followed by a liberal supply of food."

A respiration apparatus with an automatic device for oxygen determination for use with small animals, L. S. FRIDERICIA (*Biochem. Ztschr.*, 54 (1913), No. 1-2, pp. 92-107, figs. 3).—A description is given of the apparatus which is essentially a combination of the Haldane respiration apparatus and the Regnault-Reiset apparatus, in which the oxygen consumption is measured both directly and indirectly.

In a series of control experiments, the length of which varied from 2½ to 24 hours, an accuracy of not less than 99.5 per cent is claimed for the apparatus when the experimental periods were longer than 3½ hours.

ANIMAL PRODUCTION.

The making and feeding of silage, T. E. WOODWARD ET AL (*U. S. Dept. Agr., Farmers' Bul.* 556, pp. 24, figs. 6).—This publication discusses the general advantages of silage; silage crops, especially corn and sorghum; harvesting the crop and filling the silo; total cost of silage; losses of feed material in the silo; feeding value of silage; and silage rations for dairy stock, horses, beef cattle, and sheep.

A notorious Indian fodder grass, R. S. HOLE (*Indian Forester*, 39 (1913), No. 6, pp. 259-263, pl. 1).—An account of the feeding value of Johnson grass (*Andropogon halepensis*), which is a common grass of India. It is pointed out that at times the grass contains prussic acid and is then poisonous to cattle. Aside from this danger it is regarded as an excellent fodder grass for cattle.

Peanut oil cake, LE CONTE ET AL. (*Bul. Soc. Nat. Agr. France*, 73 (1913), No. 5, pp. 372-384).—A discussion of the feeding value of peanut cake, in which favorable results are claimed for this feed especially for dairy cows, but depending upon the method of manufacture and freedom from impurities. Poisonous properties are sometimes ascribed to this cake, probably due to the presence of castor beans.

On the pressed cake of Perilla seed, G. BREDEMANN (*Landw. Vers. Stat.*, 78 (1912), No. 5-6, pp. 349-365, pls. 2, fig. 1).—This is mainly a botanical description of *Perilla ocimoides* and other varieties of the Perilla plant, with comments on the use of the pressed seed for feeding purposes.

[Commercial stock feeds], W. A. McRAE (*Bien. Rpt. Dept. Agr. Fla.*, 12 (1911-12), pp. 131-134, 146-158).—This report outlines in brief the laws and regulations relating to the sale of commercial stock feeds in Florida.

Phosphoric acid, calcium phosphate, and other phosphorus compounds in animal nutrition, GIRARD (*Rev. Vét. [Toulouse]*, 38 (1913), Nos. 8, pp. 461-467; 9, pp. 525-541).—This is a discussion of the importance of phosphoric acid and of phosphates, especially calcium phosphate, in living organisms; the constant elimination of phosphorus from animals; the necessity of supplying phosphorus compounds in the feeding stuffs sufficient to cover these losses and to satisfy the needs of the organism for growth; and the progressive impoverishment of the usual home-grown feeds in phosphoric acid in available form.

With reference to supplementing the usual supply of phosphorus the author comments on the origin and nature of phosphatic feeds, notes the assimilability of organic phosphates, gives the phosphoric acid content of feeds rich in phosphorus, and reports a study of a utilization of mineral phosphates by animals. It is stated that young animals and animals with diseases due to malnutrition can best utilize mineral phosphates. The rôle of micro-organisms in the utilization of mineral phosphates is also discussed.

On the cost of meat production, D. LAN and P. C. MENDOZA (*Bol. Min. Agr. [Buenos Aires]*, 15 (1913), No. 1, pp. 105-146).—This is a statistical report of live-stock conditions in Argentina, showing the rapid development of the industry and the increased importance of trade relations with the United States and other countries. The cost of meat production in Argentina is estimated from one source at approximately 8.5 cts. per pound, live weight.

[Beef cattle in Argentina], E. COTRIM (*Bol. Min. Agr. [Buenos Aires]*, 15 (1913), No. 1, pp. 147-163).—A further discussion of trade relations with the United States and other countries, and giving statistics on meat exports. The relation of American packing companies to the progress of the beef industry in Argentina is discussed, showing wherein these companies are absorbing a large portion of the trade and advocating more competing firms.

Feeding experiments on the value of the digestible nutrients in roughages and concentrated feeds, W. SCHNEIDEWIND (*Landw. Vers. Stat.*, 79-80 (1913), pp. 207-218).—Six lots of 5 steers each were fed 133 days, 3 lots receiving a heavy allowance of roughage (straw and hay) and a light allowance of concentrates (corn meal, cotton-seed meal, and roots), and the 3 other lots receiving a light roughage allowance and a heavy feed of concentrates.

The former made an average daily gain per head of 0.85 kg., costing 0.936 mark per kilogram (about 10 cts. per pound), whereas the latter made 0.96 kg. gain, at a cost of 1.136 mark. The lots receiving a highly concentrated feed were appraised higher, showed a greater dressing percentage and a smaller water content of flesh, and produced a profit of 44.07 marks per head more than those fed the ration low in concentrates.

Advantages from use of pure-bred ram, H. HACKEDORN (*Missouri Sta. Circ.* 65, pp. 231-241, figs. 8).—Results of breeding experiments, in which 2 lots of western ewes of 17 ewes each, one lot bred to an inferior ram, the other to a superior pure-bred ram, are summarized as follows:

Of the lambs sired by the inferior ram 18 had made an average total gain at 3 months of age of 41.54 lbs. as compared with 49.97 lbs. with 18 of the lambs with superior breeding, and the latter were 9.39 lbs. heavier. The respective grain consumption per 100 lbs. gain was 67.66 and 52.81 lbs., and the selling price 4.5 and 7.35 cts. The lambs of superior breeding were thicker fleshed, smoother, broader in back, and lighter in pelt than those of inferior breeding.

Sheep for Washington farms, R. C. ASHBY (*Washington Sta. Popular Bul.* 57, pp. 16).—A popular bulletin treating of the opportunities for sheep farming in this State and the general methods of management involved.

Lamb feeding and sheep husbandry in Idaho, W. L. CARLYLE and E. J. IDINGS (*Idaho Sta. Bul.* 77, pp. 3-37, figs. 11).—This bulletin deals with the opportunities for sheep feeding in Idaho, discusses the selection of the farm flock, the utility value of the various breeds, and approved methods of flock management, and reports feeding experiments conducted during the seasons of 1910-11 and 1912-13 to determine the practicability of marketing alfalfa hay by feeding it to lambs, and to ascertain the comparative value of home-grown grains for fattening lambs.

In the first of these experiments, 139 head of Lincoln-Merino, averaging 68 lbs. each, and 161 Shropshire-Merino wethers, averaging 65.7 lbs., were fed for a period of 84 days on a ration of alfalfa hay and a grain mixture of barley, wheat, and corn 2:1:1. The first lot made an average total gain of 26.4 lbs. per head, the second lot 27.4 lbs. The lambs were sold at a slight loss, largely because of unusual transportation charges. The shrinkage in reaching the market ranged from 4.2 per cent to 7.3 per cent.

In the second experiment 251 lambs averaging 73.2 lbs. in weight were fed for 122 days on a ration of alfalfa and a grain mixture of barley and oats 3:1; another lot of 254 lambs was similarly fed except that wheat was substituted for barley. The former lot made an average total gain of 31.4 lbs. per head and produced a net profit of 90 cts. per head; the latter made 34.2 lbs. gain and a net profit of 85 cts. per head. The shrinkage in marketing ranged from 9.6 per cent to 11.2 per cent.

General conclusions indicate an increased value of alfalfa when marketed through fattening lambs, and the value of home-grown small grains as feed for lambs. The Shropshire cross proved to be slightly superior to the Lincoln cross for fattening purposes.

Feeding experiments with lambs, 1908-1911, G. E. MORTON (*Colorado Sta. Bul.* 187, pp. 16, figs. 3).—These experiments with range-bred lambs continued earlier work (E. S. R., 23, p. 277).

In the first series, 3 lots of 40 lambs each were fed alfalfa hay (whole) and Scotch barley; alfalfa hay (whole) and corn; and alfalfa hay (cut) and corn. During the seventh week the experiment was invalidated due to loss caused by dogs, lots 1 and 2 suffering approximately 9 lbs. loss per head. In spite of this condition, lot 3, fed chopped hay, made but 0.12 lb. per head greater gain during the 14 weeks' feeding period than did lot 2, fed whole hay.

In the second series of experiments, 4 lots of 125 head each were fed 14 weeks, with the following results: Lot 1, fed Scotch barley and alfalfa hay (whole) in self feeders, made 29.32 lbs. gain per head, costing 5.22 cts. per pound of gain. Lot 2, fed corn and alfalfa hay (cut) in self feeders, made 30.12 lbs. gain, at a cost of 5.71 cts.; lot 3, fed corn and alfalfa hay (whole) in self feeders, 30.8 lbs. gain, at a cost of 5.19 cts.; and lot 4, fed corn and alfalfa hay (whole) on the ground, 30.96 lbs. gain, at a cost of 5.3 cts. There was a slight advantage in favor of the whole hay. It is estimated that an average saving of 35 cts. per running foot of rack was realized over the ground feeding method.

Comparing barley and corn, a trifle less hay and more grain were used by the barley-fed lot than by the corn-fed lot.

In the third series of experiments, 3 lots of 100 head each, fed for 14 weeks, gave the following results: The first lot, fed alfalfa hay and California feed barley, made an average gain per head of 30.14 lbs., at a cost of 5.45 cts. per pound of gain; the second lot, fed alfalfa hay and Scotch barley, 33.52 lbs. gain, at a cost of 5.01 cts.; and the third lot, fed alfalfa hay (whole) and corn, 31.86 lbs. gain, at a cost of 5.02 cts.

It is noted that less grain and hay were required for the Scotch barley-fed lot than for that receiving California feed barley.

In another experiment, 2 lots of 100 lambs each were fed for 10 weeks, with the following results: Lot 1, fed alfalfa meal and corn, gained 28.54 lbs. per head, at a cost of 5.03 cts. per pound of gain; lot 2, fed cut alfalfa hay and corn, 23.93 lbs. gain, at a cost of 5.24 cts. (Cut hay was valued at \$6, alfalfa meal at \$10 per ton.) Less hay and corn were required by the meal-fed lot.

From the foregoing experiments it is concluded that self feeders are advantageous; that a heavy 2- or 4-rowed barley is preferable for feeding purposes to a light 6-rowed barley; and that in general it will not pay to reduce a good quality of alfalfa hay, although it is recognized that reducing alfalfa increases the feeding value of an ordinary grade from 15 to 25 per cent.

Plans of self feeders and of feeding yards are included.

Breeding lambs for fur, H. D. SMITH (*Farm and Ranch*, 32 (1913), No. 36, pp. 1, 2, figs. 6).—An account is given of extensive breeding operations being carried on in Kansas in crossing American Lincoln ewes with the fur-bearing caracul rams from Asia.

Three kinds of fur are obtained from these crosses, i. e., first grade or Persian lamb, if the curls are small and very tight; second grade or Astrakhan, if the curls are looser; and third grade or Krimmer, when the fur is streaked with gray. The hybrids resulting from this cross are said to be very hardy, withstanding both drought and cold, and excellent rustlers. It is believed that Cotswold, Leicester, and Wensleydale ewes can be used with as satisfactory results as the Lincolns.

Docking and castrating lambs, H. HACKEDORN (*Missouri Sta. Circ.* 61, pp. 207-210, figs. 2).—This circular describes the knife and hot pincers methods of docking lambs and a common method of castrating.

Dalgety's annual wool review for Australasia (*Dalgety's Ann. Wool Rev. Austral.*, 1912-13, pp. 102, pl. 1).—This publication gives a complete summarized account of the commercial wool industry in the markets of Australasia, with references to the markets of Europe and America. The topics included are market record, character of the clip, the producers' and buyers' positions, demand and distribution, American demand, American tariff, trade with the East, wool production estimates and the wool outlook, wool-selling methods, preparation of clip, excellence of Australian wools, competitors, wool substitutes, and other related subjects.

Productive swine husbandry, G. E. DAY (*Philadelphia and London*, 1913, pp. X+330, pls. 2, figs. 70).—This is a popular work dealing with the breeds of swine, the results of swine-feeding experiments, and the care, management, and marketing of swine, together with building specifications and directions.

Ration experiments with swine, 1908-1911, G. E. MORTON (*Colorado Sta. Bul.* 188, pp. 20, figs. 3).—Continuing previous work (*E. S. R.*, 24, p. 269), 6 lots of 10 head each of 48-lb. pigs were fed in 1908 and 1909 for a period of 14 weeks on various proportions of corn and selected tankage and corn and fertilizer tankage. The gains made apparently justified the use of the lower-priced fertilizer tankage as compared with the selected material. The feeding of corn, barley, and selected tankage 3:3:1 proved slightly more expensive per 100 lbs. gain than did a ration composed of corn and selected tankage 6:1. The feeding of corn and shorts 2:1 produced less gain and at a somewhat higher cost per pound of gain than the corn and tankage ration.

In 1909 and 1910, 10 lots of 10 head each of approximately 175-lb. pigs were fed for a period of 8 weeks on various proportions of California feed barley with selected tankage, fertilizer tankage, shorts, corn, alfalfa hay, or sugar beets, and 1 lot on winter rye. The best ration in the series proved to be one consisting of California feed barley and corn 1:1, with alfalfa hay ad libitum, the hay being fed whole in racks. This ration cost 4.83 cts. per pound of gain. A ration of California feed barley and fertilizer tankage 9:1, costing 5.05 cts. per pound of gain, was second in economy and preferable to rations composed of either 7 or 5 parts barley. A ration of barley and alfalfa hay alone without corn cost 5.06 cts. per pound of gain, and a ration of barley and sugar beets

4:1 cost 5.37 cts., which under most conditions is considered reasonable. The feeding of rye alone proved unsatisfactory.

In 1911, 4 lots of 8 head each of approximately 116-lb. pigs were fed during a period of 8 weeks with the following costs of gain per pound: Corn and shorts 1:1, 5.72 cts.; corn and alfalfa meal 4:1, 4.84 cts.; corn and alfalfa meal 5:1, 5.35 cts.; and corn and alfalfa meal 6:1, 5.08 cts.

During the 2 years feeding at the station no ill effects upon hogs was caused by fertilizer tankage, which was obtained at a much lower price. It is stated, however, that "while feeders, particularly those operating on a large scale, may save considerable money by the use of fertilizer tankage, they should make sure of the process of preparation of the product before using it."

Plans for industrial hog houses, alfalfa feeding racks, and feeding troughs are included.

Pig-feeding experiment, C. HUTCHINSON (*Jour. Southeast. Agr. Col. Wye, 1912, No. 21, pp. 29-43*).—Tests were made "to determine the value of gram as a substitute for separated milk in combination with middlings in the feeding of newly-weaned pigs intended for sale as porkers."

It is concluded that "0.5 lb. per day of gram meal to newly-weaned pigs is a perfectly safe food. In combination with middlings it constitutes a good and economic ration, which can confidently be recommended where separated milk is not available."

Feeding work horses, C. W. McCAMPBELL (*Kansas Sta. Bul. 186, pp. 13-70, figs. 14*).—A portion of this work has been previously reported from another source (*E. S. R., 27, p. 772*).

It was found that the substitution of corn, bran, and linseed meal 6:3:1 for oats in a ration for work horses proved quite satisfactory, although the gains in weight were not so great. Two rations consisting of corn and oats 1:1, but differing in that one had also 4 lbs. of bran, the other 1 lb. of old process linseed meal, showed practically no difference in results aside from a sleeker coat of hair with the linseed-meal-fed horses. It was found that pound for pound, oats and barley are practically equal as feed for horses, although the oats are to be preferred due to their superior effect upon the general condition of the animal. The substitution of $\frac{1}{2}$ lb. of brown sugar for 2 lbs. of oats in the ration proved to be impracticable, although a small amount of sugar is recognized as an excellent appetizer. The sugar-fed horses sweated more easily and more profusely but showed excellent coats of hair and good appetites.

Comparing alfalfa meal and bran it was found that these feeds are practically equal pound for pound, and that alfalfa meal lessens the daily cost about 1 ct. per 1,000 lbs. live weight. However, the alfalfa meal is in disfavor due to its dust and irritation to the mucous membranes. Furthermore, the danger of adulteration and use of poor hay is suggested. Alfalfa hay, corn, and oats, as compared with oats and prairie hay, proved cheaper and produced greater gains. Four lbs. of alfalfa meal, substituted for 2 lbs. of corn and 2 lbs. prairie hay, resulted in no reduction in cost. It is estimated that 1 lb. of alfalfa hay is equal to 2 lbs. of prairie or timothy hay. It reduced the amount of hay fed 30 per cent and the amount of grain 16 per cent; the cost was less and the gains were greater. Timothy hay proved to be slightly superior to prairie hay as a feed for work horses.

The feed and care of stallions, brood mares, foals, and growing horses are discussed, and rations suggested.

[Report of the] Kansas State Live Stock Registry Board (*Kansas Sta. Bul. 183, pp. 105*).—This bulletin contains a report of the fifth annual meeting of the Kansas Horse Breeders' Association, lists of the stallions licensed and trans-

ferred from October, 1911, to October, 1912, with data as to the age, breed, and condition of soundness, and a summary of results and general conclusions in the horse-feeding experiments reported in Bulletin 186 (see p. 873).

How the English are breeding polo ponies to type, T. F. DALE (*Spur*, 12 (1913), No. 8, pp. 22, 23, figs. 2).—An account of the establishment in England of a polo pony type, tracing to the native breeds of ponies, Welsh, Exmoor, and Dartmoor, together with the English thoroughbred.

A wild pony fair (*Spur*, 12 (1913), No. 9, pp. 38, 39, figs. 2).—An appreciation of the value of the Welsh and Exmoor wild ponies as foundation stock for the breeding of remounts for mounted infantry service. It is said that a cross with a suitable thoroughbred should produce a horse about 14.2 hands high, speedy, kind, hardy, capable of foraging for himself, and easy to mount. Wild pony fairs are held in March, June, October, and November in Bampton, England, at which times many of these hardy animals are bought and distributed over the country.

Investigations on the primary gonocytes during the period of sexual indifference and the development of the ovaries in the fowl, J. FIRKET (*Anat. Anz.*, 44 (1913), No. 8-9, pp. 166-175).—From a review of the work of others along this line and as the result of studies made by himself, the author concludes that (1) these gonocytes are displaced by movements of their own analogous to those of leucocytes; (2) they are of sexual nature because they pass through phases typical of those in the evolution of sexual cells; (3) a large part of them degenerate in the fowl; it can not be affirmed whether or not some give rise to fully developed ovules in the cortical zone of the ovary; (4) a second line of sexual cells exists in birds; it is from these that the majority of definite ovules originate. The terms primary gonocytes and secondary gonocytes are therefore justified.

A bibliography of 16 titles is included.

Jumping conformation, ST. GATIEN (*Live Stock Jour.* [London], 78 (1913), No. 2055, pp. 195, 196).—The author regards as desirable "good, broad loins, muscular and powerful quarters, and stout hind legs, constituting, so to speak, the fundamental basis upon which good jumping powers are built up." The hocks should be especially strong and should be well let down, the distance between the point of the hip bone and the hock joint being as great as possible. It is noted that a well-sloped position of the pelvis facilitates jumping, the explanation being that horses possessing the sloping or drooping quarters are particularly favorably placed for bringing their hind legs well underneath the body when preparing to leap. Jumpers should be light in front, with sloping shoulders, thus aiding in taking off the jump as well as in coming to the ground easily. The fore legs should be as tough and stout as possible, as they bear the whole force of the leap when they first come to the ground. Shortness of back is also desired in a jumper, denoting strength and durability.

Breeding for heavy egg production, R. PEARL (*Rel. Poultry Jour.*, 20 (1913), No. 7, pp. 812, 813, 860-862).—This is a popular exposition of technical work previously reported (*E. S. R.*, 28, pp. 576).

The author summarizes the general rules for the breeding of poultry for heavy egg production as follows: (1) Selection of all breeding birds, first on the basis of constitutional vigor and vitality, which should be determined by their normal growth, their performance in respect to the vitality of their chicks (this being charged up against the dam), their freedom of or immunity against sickness, and their longevity. "(2) The use as breeders of such females only as have shown themselves by trap-nest records to be high producers, since it is only from such females that there can be any hope of getting males capable

of transmitting high laying qualities. (3) The use as breeders of such males only as are known to be the sons of high-producing dams, since only from such males can we expect to get high-producing daughters. (4) The use of a pedigree system, whereby it will be possible at least to tell what individual male bird was the sire of any particular female. . . . (5) The making at first of as many different matings as possible. . . . (6) Continued, though not too narrow, inbreeding (or line-breeding) of those lines in which the trap-nest records show a preponderant number of daughters to be high producers."

Studies in egg marketing, C. W. THOMPSON (*Minnesota Sta. Bul. 132, pp. 45, figs. 5*).—In an analytical study of the development of egg-marketing methods the author finds that the early method was that of barter with country merchants, with the ultimate disposal of the local production to the primary markets through commission men. With the improvement in facilities for transportation and cold storage and a consequent lessening of the risk involved in handling, jobbers have found inducements to enter the primary markets and buy outright from local country dealers. The buying has been done either through traveling agents or local dealers, or through the use of mailed quotations. This method of jobbing has practically displaced the handling of eggs on commission in all western primary markets except during periods of falling prices. The shipments received have been candled and graded at the primary market to be put on the local retail trade or placed in cold storage for a future market.

The increased volume of business with attending competition has forced down the net margin on which jobbing is being done, while "the gross margin remains unnecessarily large because of losses in candling, sorting, and repacking, mainly due to the 'case-count' policy of purchasing eggs in local towns. On the other hand, the cost of storing has been reduced through economies from increased volume of business, especially by a saving on losses and insurance."

"In recent years certain localities have developed a system of marketing eggs directly to city retailers without the aid of middlemen. The success of such direct shipments has been mainly conditioned upon the ability to create and maintain a special market for high-grade quality."

Comparing the expenses incident to the direct and indirect methods of marketing eggs, it is pointed out that although the item of storage does not generally enter into the cost of the direct method, yet during seasons of oversupply the machinery which handles products shipped under the indirect method is also called upon to take care of the surplus stocks from the direct method. Other expenses incident to the indirect method are the carrying charges, including interest, rentals, and insurance connected with cold storage, together with the risks due to uncertainty in future price. With the development of the indirect method has arisen the possibility of a monopoly in the supply of the product. The author suggests that this evil may be reduced to a minimum by preventing a narrowing of the distributing channel between the producer and the consumer by encouraging the establishment of as many routes as possible according to the direct method.

With the perfection of the cold-storage facilities has come the evil of selling storage eggs as fresh eggs. This, however, it is believed may be corrected through government regulation and control. It is particularly noted that cold storage lessens fluctuation in prices at different seasons and renders a high-class product available to consumers during periods of scarcity.

Preserving eggs, G. A. OLSON (*Washington Sta. Popular Bul. 54, pp. 4*).—This bulletin treats of the water-glass method of preserving eggs, of the selection of eggs for preserving, and of the preparation of the preserving solution.

DAIRY FARMING—DAIRYING.

Record of the station dairy herd and the cost of milk production, J. B. LINDSEY and P. H. SMITH (*Massachusetts Sta. Bul. 145, pp. 31*).—"This bulletin contains a record of the amount and cost of the feed consumed and of the milk produced by each cow in the station herd from 1896 through 1911.

"The estimated cost of housing and caring for the cow and her product is also stated, which, added to the feed cost, shows a total average yearly cost of \$145.24 per cow. The average yearly production was 6,036 lbs., and the estimated cost of a quart of milk averaging 5 per cent of fat is shown to be 5.43 cts. Data from other sources are also cited."

It is found that to produce 100 lbs. of milk, 117.9 lbs. of dry matter or 76.4 lbs. digestible matter are required; to produce 1 lb. of solids, 8.28 lbs. dry matter or 5.34 lbs. digestible matter; and to produce 1 lb. of fat requires 23.3 lbs. of dry matter or 15.06 lbs. digestible matter. It is further shown that the largest producers required the smallest amount of feed to make a definite amount of product. Large cows produced milk rather more economically than smaller ones.

Dairying in Oklahoma, R. C. POTTS and C. I. BRAY (*Oklahoma Sta. Bul. 99, pp. 55, figs. 7*).—In experiments comparing the feeding value of alfalfa and cowpea hay for dairy cows, no appreciable difference in yields was noted, although some of the cows showed an individual preference for one or the other of the two hays. Prairie hay produced 9 per cent more milk and 5 per cent more milk fat with a greater economy of production than did Bermuda hay. Bermuda pasture, however, produced 13.6 per cent more milk and 13.8 per cent more milk fat than did prairie pasture. This indicates that Bermuda grass is more valuable as a pasture than as a hay. The feeding value of one hour of grazing on wheat pasture was apparently more than equivalent to 10 lbs. of sugar beets.

The principles of dairy cattle feeding are discussed, together with notes on feeding stuffs. Experiments with cotton-seed meal and silage, previously reported (*E. S. R.*, 27, p. 280) are given. The general principles of the care and management of dairy cattle are also considered, including data on dairy barns and stables.

[Dairy experiments at Hameln, 1912], P. VIETH (*Ber. Milchw. Inst. Hameln, 1912, pp. 28+6*).—This contains brief reports of 70 different tests and experiments, most of them on the composition and physical condition of cream, milk, butter, cheese, and dried milk under various conditions and under different methods of tests.

The correlation between the percentage of milk fat and the quantity of milk produced by Ayrshire cows, H. D. VIGOR (*Jour. Bd. Agr. [London], 1913, Sup. 11, pp. 28*).—With the object of ascertaining the relationship between the rate of milk production of cows and the percentage of milk fat in the milk produced, the complete records of 586 Ayrshire cows were studied with reference to the duration of the lactation period and the age of the cows, with results summarized as follows:

Averages and standard deviations as to milk and milk production of 586 Ayrshire cows.

Variable factor.	Average.	Standard deviation.
Percentage of milk fat.....	3.6811 per cent.....	0.3229 per cent.
Weekly yield.....	16.8287 gallons.....	4.0704 gallons.
Duration of lactation.....	33.1104 weeks.....	9.2552 weeks.
Age of cow.....	5.6613 years.....	2.8339 years.

The author concludes that "after allowance has been made for the varying age and duration of the lactation period of the Ayrshire cows under examination, the milk of cows which gave the larger average weekly yields of milk shows a definite and appreciable tendency to be poorer in milk fat than the milk of cows which gave lower average weekly yields. The duration of lactation, had no significant influence upon the average percentage of milk fat produced.

"The percentage of milk fat showed a slight, but definite, tendency to be lower in the older than in the younger cows, after due allowance has been made for the average weekly yield of milk. Taking the herd as a whole, the duration of the lactation bore no relation to the average weekly yield of milk produced by the cows. There is thus no evidence, in the Fenwick herds, of a selective action in favor of retaining in milk those cows that gave a better average yield of milk than others. In the herd under examination, the older cows show a definite and appreciable tendency to give larger yields of milk than the younger cows. This may possibly be due partly to a selective action in weeding out cows which proved unpromising as regards their milk yield when young, and partly to a physiological tendency for older cows to give better yields than younger ones. To what extent, however, the tendency may be due to selective or to physiological causes, the coefficient, as it stands, does not permit of determination. The duration of lactation has possibly tended to be longer in older than in younger cows. On this point, however, the evidence is not quite definite. The existence of such a tendency might be due to selective action in weeding out from the herd those cows whose lactation was rather short, or to physiological causes, tending to extend the duration of lactation in older cows. The value of the coefficient, however, makes it doubtful whether either tendency really exists."

The regression equation, representing the most probable value of a deviation from the mean percentage of fat in terms of deviations from the means of the other variables, is: $x_1 = -0.022 x_2 + 0.002 x_3 - 0.018 x_4$, in which x_1 =a deviation from the average percentage of milk fat; x_2 =a deviation from the average weekly yield; x_3 =a deviation from the average duration of lactation; and x_4 =a deviation from the average age of cows. From this it is possible in practical use to determine the approximate relation that is to be expected between milk yield and percentage of milk fat when either of these factors are increased or diminished. However, the author explains that "while this result may be regarded as the most probable, in the long run the certainty of attaining it diminishes when only a small number of cows is being dealt with, and increases proportionately with the number of cows in the herd in which the policy of selecting cows with higher milk yields is pursued."

On the effect of the neutralization of a culture medium with chalk on the activities of the sour milk bacteria, J. A. MAKINOFF (*Centbl. Bakt.* [etc.], 2. Abt., 37 (1913), No. 22-25, pp. 609-622).—After outlining the work of previous investigators the author discusses investigations conducted to determine the amount of acid produced and the time required to produce sour milk under neutralized conditions. It was found that chalk is a suitable neutralizer.

Milk hygiene, W. ERNST (*Grundriss der Milchhygiene für Tierärzte.* Stuttgart, 1913, pp. VIII+301, pls. 5, figs. 26).—This is a treatise on milk hygiene, including chapters on the anatomy and pathology of the milk gland; the physiology of lactation; the microscopical characteristics of milk; the composition of milk and its biological, chemical, and physical characteristics; internal influences on the character of milk; bacteria; and milk control and investigation.

The effect of certain dairy operations upon the germ content of milk, H. A. HARDING, G. L. RUEHLE, J. K. WILSON, and G. A. SMITH (*New York State Sta. Bul.* 365, pp. 197-233).—This is a continuation of work previously reported (*E. S. R.*, 22, p. 178; 24, p. 582; 29, p. 279).

In determining the bacterial content of first, middle, and last-drawn milk as it is poured from the pail, in about one-fourth of the sets of samples the highest germ content was found in the first sample of the set, and in more than one-half of the cases the highest numbers were obtained from the last of the 3 samples. It is concluded that no reasonably constant relation exists between the germ content of samples collected. Observations were made of the bacterial content of foam, milk from the center of pail, and well stirred milk, with similar variations. Fifty per cent of the highest samples were found among those taken after a thorough stirring of the milk and 39 per cent of the medium samples were in this class.

On comparing the germ content of samples obtained by pouring and by a sterile spoon, the larger average count was found in the spoon samples. The protection of milk pails from accidental contamination after they had been thoroughly steamed had a measurable effect in reducing the germ content of the milk. Plastering and whitewashing the stable was not found to have any measurable effect over previous conditions in which dust had been allowed to accumulate. It was noted that the individuality of the cow is apparently of importance, the germ content being low with some and high in others. The authors "suggest that the importance of barn construction has been considerably overestimated and that within rather wide limits the condition of the stable exerts no measurable influence upon the germ content of the milk produced within it."

The germ content of the milk was apparently slightly increased on clipping the udder, flank, and adjoining portions of the cow. The effect of brushing and combing at the rate of 2 cows per minute was practically the same as treatment with the vacuum cleaner at the rate of 1 cow per minute. When all of the utensils had been carefully steamed, cooling and straining the milk resulted in only a small increase in germ content even when this was done under unfavorable conditions.

Some unessential dairy refinements, F. H. HALL (*New York State Sta. Bul.* 365, popular ed., pp. 8, fig. 1).—A popular edition of the above.

Cleanliness and cold as applied to the dairy, A. B. NYSTROM (*Washington Sta. Popular Bul.* 55, pp. 8).—A popular bulletin dealing with the general principles of sanitation in the dairy.

Medical milk commissions and certified milk, E. KELLEY (*U. S. Dept. Agr. Bul.* 1, pp. 38, pls. 5, fig. 1).—This is an extensive revision of a former publication (*E. S. R.*, 20, p. 78).

From the reports of 63 local commissions it is estimated that in 5 years there has been an increase in the production of certified milk of about 300 per cent. However, the increase in demand has not been great, perhaps because of the greater cost. The average price of certified milk is reported as 14.2 cts. per quart as compared with 7.8 cts. for ordinary milk. The belief among dairymen that the production of clean milk involves a large outlay for expensive equipment, and the misrepresentations sometimes attempted by producers with no connection with milk commissions have also worked to the detriment of the industry.

The equipment and methods necessary in the production of certified milk are discussed in detail. The scoring of 37 certified milk farms gave an average of 90 points out of a possible 100, as compared with an average score by 953 ordinary dairies of 41.3 points. The average score of 89 samples of certified

milk and cream at various milk contests was for milk 87.96 and for cream 87.82. It is noted that "the greatest fault in these samples was that relating to flavor and odor rather than to bacterial count."

Answers to inquiries regarding the profitableness of certified milk production were about evenly divided. It is concluded that profits frequently depend upon the application of business methods. Heavy losses are attributed to too elaborate equipment and the carrying of low-yielding, unprofitable cows.

The methods and standards for the production and distribution of certified milk, as adopted by the American Association of Medical Milk Commissions in 1912, are appended.

Directions for testing cream, L. G. RINKLE (*Missouri Sta. Circ. 64, pp. 223-230, figs. 14*).—This circular gives directions for testing cream, including sampling, weighing, operating testing machines, reading the test, etc.

Cause of variation in percentage of fat of market cream from farm separators, V. R. JONES (*Washington Sta. Popular Bul. 53, pp. 8*).—A compilation from various station bulletins presenting data as to the several factors which influence the variation in percentage of fat from farm separators.

The permit system of cream buying, G. S. HINE and W. F. DROGE (*Kansas Sta. Bul. 184, pp. 5-48, figs. 36*).—This bulletin is a treatise on cream buying and creamery practice for the information of persons about to engage in sampling and testing cream. The subjects under discussion are cream station equipment; instructions for receiving, sampling, testing, and paying for cream; testing milk and skim milk; financial problems; systems of examinations, permits, and inspections; control of flies; satisfying patrons; cream station conveniences; and bacteria and their control.

Homogenizer experiments, J. L. BISHOP and R. M. MURPHY (*N. Y. Produce Rev. and Amer. Cream., 36 (1913), No. 11, p. 478*).—Experiments with the homogenizer, carried on at the Wisconsin University Dairy School and presented in thesis form, are summarized as follows:

"After homogenizing milk the cream did not rise by gravity and could not be separated by the centrifugal separator. The resulting tests of the cream and skim milk from a quantity of homogenized milk run through a power separator were cream 7.5 per cent fat and skim milk 3.2 per cent fat, the fat test of the original milk being only 3.5 per cent. The size of the fat globules was greatly diminished by homogenizing with a proportionate increase in the number present. . . . The number of bacteria was increased from 1,500,000 per cubic centimeter to 11,500,000 per cubic centimeter by homogenizing at temperatures sufficiently low as not to kill the bacteria present. In commercial homogenization, however, the general practice of pasteurizing the milk at 185° F. before homogenization destroys practically all bacteria present.

"Homogenizing cream increases its viscosity. A 15 per cent cream after being homogenized has the appearance of a 25 per cent normal cream, and a 20 per cent homogenized cream has the appearance of a 40 per cent normal cream. The cooked flavor imparted to milk and cream by pasteurization at high temperatures is eliminated by homogenizing it. The keeping quality of milk or cream pasteurized at 185° was not affected in any way by homogenization. . . . Homogenized cream could not be churned, . . . and when added to coffee did not mix so readily as normal cream. . . .

"Ice cream made from homogenized cream possessed a much improved body, smoother texture, and richer flavor, even when a 15 per cent cream was used, than when unhomogenized. Butter fat and skim milk were successfully homogenized into cream for ice cream making. Also cotton-seed oil and other fats were incorporated in skim milk for stock feeding purposes, so that they did

not separate out. The loss of fat in the whey was decreased from 0.15 to 0.05 per cent by homogenizing milk used in cheese making. Homogenizing butter-milk did not prevent the curd from separating. It was smoother immediately after passing through the machine, but wheyed off as soon if not sooner than the normal buttermilk. Repasteurizing homogenized cream destroyed the viscosity imparted by homogenization."

Milk powders and condensed milk [analyses of], A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul.* 257, pp. 13).—This reports analyses of numerous samples of milk powders and condensed milk, in which it was found that the majority of brands came up to standard in fat content although some few were deficient in this respect.

The new warm-chamber method of making "Grana" cheese, A. OLIVA (*Caseificio Mod.*, 6 (1913), No. 6, p. 85; *abs. in Internat. Inst. Agr. [Rome]*, Mo. *Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 6, pp. 953, 954).—The author outlines a new method (proposed by Prof. Samarani of the Royal Cheese-Making Experiment Station at Lodi) for making "Grana" cheese, which eliminates the usual swelling of the curd with a consequent loss of the characteristic appearance and flavor of this cheese. This method, known as the "warm-chamber method," is practiced as follows:

"(1) The filtered milk is cooled in a refrigerator to a temperature below 18° C. (64.4° F.), when it is placed in metal basins to let the cream rise; these basins, which must not be of polished copper, are immersed in water, kept always at a temperature below 18° C. By this treatment the milk descends into the boiler without any natural fermentation taking place, and it retains its natural acidity unchanged.

"(2) Before the addition of the rennet, the selected lactic ferments (lactic bacilli) are added to the milk in the proportion of 1:1,000 by volume; these micro-organisms possess the maximum fermentative power (virulence) obtained by growing them in a suitable sterilized liquid prepared on a basis of peptone and lactose neutralized with carbonate of lime. To insure vigorous action, fresh ferment should be added regularly, without interruption, at 24 hours interval, and developed at a temperature of 32 to 35° C. Before each ferment is used the quantity necessary for the succeeding inoculation is set apart in the proportion of 5 per cent. (3) The form, on leaving the boiler, passes into a warm chamber at 37 to 40° C., the optimum temperature for the development of the bacillus forms of lactic ferments; here it remains for 12 to 14 hours, until the lactic fermentation is complete; this is recognized by the plasticity of the curd."

Favorable results are reported although further investigation will be made before a definite judgment is passed.

VETERINARY MEDICINE.

The diseases of animals, N. S. MAYO (*New York and London*, 1913, 8. ed., pp. XVI+459, figs. 59).—A revised edition of the work previously noted (E. S. R., 15, p. 718).

Report on the operations of the veterinary sanitary service of Paris and the Department of the Seine during the year 1912, H. MARTEL (*Rap. Opér. Serv. Vét. Sanit. Paris et Dépt. Seine*, 1912, pp. 224, figs. 17).—A continuation of the reports previously noted (E. S. R., 28, p. 78).

Pathological dangers to domestic animals from contaminated streams, H. N. PARKER (*Amer. Jour. Pub. Health*, 3 (1913), No. 1, pp. 67-71).—In the preparation of this paper the author has made use of information received from

32 state boards of agriculture, 10 experiment stations, 4 live stock boards, 42 state boards of health, and 11 individuals, in reply to letters of inquiry.

Observations in regard to the rotation of blood plasma and serum from various animals of different ages and sex, E. ABDERHALDEN and A. WEIL (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 81 (1912), No. 3, pp. 233-238).—The rotation of the plasma and serum will give a rapid insight as to the relative amounts of optically active substances, i. e., carbohydrates and various proteins, present in the blood plasma or serum. For this investigation the plasma and serum of horses, bovines, pigs, sheep, guinea pigs, and fowls were studied. Castrated male and female animals were among the various mammals.

The results show that the blood serum from normal animals rotates in the same manner as does human serum. Guinea pig serum and fowl's blood were found to have a much lower rotation. In the case of fowl's blood, it was just about one-half that of the mammals. Among the normal animals of the same species no remarkable differences were noted. Various, and in some cases, high values were obtained with the serum of horses affected with pernicious anemia. Tuberculous subjects also showed abnormally high values. The serum of horses was found to have a lower levorotation than the plasma.

In studying the blood exchange between the mother and the fetus, it was found that the serum, taken from the umbilical cord of the fetus, had a lower rotation than the blood serum of the mother. This seems to depend initially upon the lower amount of proteins which the fetal blood serum contains.

The difference between the blood and exudate leucocytes with reference to phagocytic activity, H. AMATSU (*Abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1912), No. 13, pp. 964, 965).—The phagocytic activity of the exudate leucocytes is weaker than that shown by the blood leucocytes. The phagocytic process of blood leucocytes 24 hours after extravasation remains unchanged.

A precipitin for rice proteins, S. KANAHARA (*Abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1912), No. 13, p. 963).—Immunizing rabbits with extracts of rice is found to produce a specific reagent for rice proteins. Normal human sera, or beri-beri sera, precipitate rice protein in the ratio of 1:50, and sometimes in the ratio of 1:100. No difference exists between normal and beri-beri serum in this regard.

The detection of paratyphoid infections with the aid of the precipitin test, R. REINHARDT (*Ztschr. Fleisch. u. Milchhyg.*, 23 (1912), No. 3, pp. 53-56; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1912), No. 13, p. 963).—Extracts of the organs of animals dying from paratyphoid infections yield precipitating sera of a high titer. Putrefaction does not destroy the precipitating capacity. Organs conserved in 90 per cent alcohol or in 2 per cent formaldehyde for 75 days still give specific reactions.

Tests and critical remarks in regard to Weichardt's epiphanin reaction, A. KOFF-PETERSON and H. BRINKMANN (*Ztschr. Hyg. u. Infektionskrankh.*, 72 (1912), No. 2, pp. 343-361, figs. 9).—After critically reviewing the findings of other investigators with the epiphanin reaction, the authors report results of tests to determine the limit of error of the method. It is shown that the widely divergent results obtained with the method are due to errors in measuring, and to a great extent to the influence which the carbon dioxide of the atmosphere has upon the barium hydroxid solution used in the test.

By exercising extreme care these errors are reduced to a minimum, but with the exclusion of the errors the results lose their significance. The reaction consequently does not show the relation between antigen and antibody which it is supposed to indicate.

In regard to the epiphanin reaction, C. VON ANGERER (*München. Med. Wehnschr.*, 59 (1912), No. 53, pp. 2915, 2916, figs. 6; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1912), No. 11, p. 859).—A polemic showing that the statements of Weichardt (*E. S. R.*, 26, p. 579) and others in regard to the accuracy of this reaction do not hold good.

Is the pressor effect of pituitrin due to adrenal stimulation? R. G. HOSKINS and C. MCPEEK (*Amer. Jour. Physiol.*, 32 (1913), No. 5, pp. 241-244).—"Intravenous injections of pituitrin in small dosage can be repeated at intervals of 10 or 15 minutes without significant failure of their pressor effect. The adrenal glands of the dog can be ligated off without affecting general blood pressure; in the pregnant cat, however, such ligation has been observed to cause fall of blood pressure with subsequent rise when the ligatures were released. In either animal occlusion of the adrenal circulation does not diminish the pressor effect of a standard dose of pituitrin. There is probably, therefore, no direct dependence of adrenal functioning upon pituitary secretion."

The selective bactericidal action of methylene blue, J. W. CHURCHMAN (*Jour. Expt. Med.*, 18 (1913), No. 2, pp. 187-189, pl. 1).—"It has been found that methylene blue, like gentian violet, is without effect on the growth of *Bacillus typhosus* and *B. coli*, but that, unlike gentian violet, it exhibits a selective action when *B. subtilis* and *Micrococcus aureus* are planted on divided plates containing it."

Precipitin diagnosis of symptomatic anthrax, with a contribution to the question of the thermostability of the precipitinogen, V. HECHT (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 67 (1912), No. 5, pp. 371-381, figs. 2).—In addition to what is mentioned in the title, the results of some experiments made with 3 horses on the thermo-resistance of the precipitinogens for the *Bacillus erysipelatis suis*, are reported. It is shown that they are more heat stable than has usually been supposed.

With the aid of the Ascoli thermo-precipitin reaction it is possible to detect symptomatic anthrax infections in heated and prepared meat goods. The reaction, when using boiled sodium chlorid extracts of the organs, has all of the characteristics of a general serodiagnostic method. It is possible to conduct the test with symptomatic anthrax serum of a high titer and extracts of the organs of animals affected with blackleg.

Noteworthy findings relative to the growth of the swine erysipelas bacillus, S. WYSCHESLESKY (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 12 (1912), No. 1, pp. 34-53, pl. 1).—The author finds *Bacillus erysipelatis suis* to develop 2 different types in gelatin stab and gelatin plate cultures.

Some investigations of *Babesia bigemina*, A. VRIJBURG (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 13 (1913), No. 3-4, pp. 180-186; *abs. in Trop. Vet. Bul.*, 1 (1913), No. 4, pp. 197-199).—The author finds the parasite which occurs in Holland to resemble *B. (Piroplasma) divergens*. The organism is a small form of *B. bigemina* such as has been described as occurring in Germany and North Africa. Attempts to cultivate *Babesia* by the Bass and Johns method failed.

A remarkable bacterial group which occurs both in man and animal, GILDEMEISTER and BAERTHLEIN (*Abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1912), No. 13, p. 988).—From the stools of humans with diseased intestines and the organs of rats and pigs affected with hog cholera a few strains (Dahlem) were isolated which, morphologically and culturally, resembled the *Bacillus voldagsen*, with the exception that they turned litmus milk blue. The Dahlem strains could be differentiated from the Voldagsen strains with the complement fixation and agglutination methods.

The detection of the *Bacillus voldagsen* in man, NEUMARK (*Abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1912), No. 13, p. 988).—A bacterium was isolated from the urine of a child showing a typhoid-like condition, which resembled, culturally and morphologically, paratyphoid B, but only agglutinated a specific *B. voldagsen* serum. As a result of scission, strains were obtained from this culture which, on the one hand, showed blue on Drigalski's medium and, on the other hand, grew red. The serum prepared from the first-named strain (titer 10,000) had no influence upon the *B. voldagsen* despite the fact that a Voldagsen serum would agglutinate it and also the daughter strain.

The work reported in regard to the occurrence of *B. suipestifer voldagsen* must consequently be revised.

The effect of quinin on rabies in dogs, V. H. MOON (*Jour. Infect. Diseases*, 13 (1913), No. 1, pp. 165-170).—In the experiments here reported dogs were inoculated with rabid brain material and allowed to develop active symptoms of rabies. "When active symptoms of rabies developed, as unusual excitability, restlessness, changed quality of the bark, decreased appetite, sometimes difficulty of swallowing, muscular spasms, paralysis of the legs, etc., the dog was given very large doses of quinin sulphate several times daily, while another dog inoculated at the same time and under the same conditions was allowed to go untreated as a control. The quinin was administered in capsules around which was stitched a thin covering of fresh tough meat as from the flank of beef. The dog would usually bolt these without chewing, but if he became unable to swallow, as happened several times, the same quantity of quinin bisulphate was given in solution hypodermically. The daily amount given a 6 or 7 kg. dog was from 1 to 1.6 gm., usually in 3 doses. This is equivalent to from 12 to 18 gm. daily for an average man, in proportion to the body weight. The medication was thus pushed to the limit to secure the full physiological, bordering on toxic, effect."

The second and third of the 3 dogs, which were treated with a total of 14.6, 13, and 7.8 gm. of quinin, respectively, were left healthy at the time of writing, while the first of the 3 died of an obscure cause 2½ months after treatment.

Spirochetosis, G. H. F. NUTTALL (*Parasitology*, 5 (1913), No. 4, pp. 262-274; *Bul. Johns Hopkins Hosp.*, 24 (1913), No. 264, pp. 33-39, figs. 9).—A résumé of our present knowledge of spirochetosis and the ticks and insects which transmit spirochetes.

The specificity of the streptococci of strangles, E. BEMELMANS (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 70 (1913), No. 3-4, pp. 148-156).—The author considers the strangles streptococcus to be a form independent of that of contagious pleuro-pneumonia and influenza, and thinks it should be given a specific place among the streptococci.

Some cases of surra treated in the field and in the laboratory during the autumn of 1911, J. D. E. HOLMES (*Mem. Dept. Agr. India, Vet. Ser.*, 2 (1913), No. 1, pp. 31).—This paper presents the details of treatment of a large number of mules and ponies with atoxyl and arsenic.

Phenol in treatment of tetanus, V. G. KIMBALL (*Amer. Vet. Rev.*, 43 (1913), No. 5, pp. 508-513).—"Phenol can be given intravenously in cases of tetanus in 1 to 6 per cent watery solution and in amounts varying from 4 to 20 oz., 3 times daily, depending upon the strength of the solution. A slight shock sometimes follows administration, but apparently is not as dependent upon dosage as upon the excitability of the patient. Shock is shown by dyspnoea and hyperexcitability and lasts about 3 minutes. To be of any benefit phenol must be given until signs of intoxication (photophobia, lacrimation, and dilatation of pupil) appear. . . . Phenol is as good as, but no better than, other agents to allay

excitability in tetanus. In tetanus phenol does not act as an antispasmodic in the ordinary sense of the word. It lessens hyperexcitability and in this way lessens muscular spasms."

Tuberculosis, D. E. SALMON (*Rev. Med. Vet. Montevideo*, 2 (1911), Nos. 8-9, pp. 309-353; 10-11, pp. 405-456; 12, pp. 505-541).—This comprises the lectures given to the classes in contagious diseases in the School of Veterinary Medicine at Montevideo, Uruguay. The material deals with the etiology, pathology, symptoms, prognosis, immunity, and protective vaccination of tuberculosis, with special reference to the disease in bovines.

A short description of the disease in pigs and birds and the relation of bovine tuberculosis to man are included.

The way Koch's bacillus enters the body, H. VALLÉE (*Rev. Gén. Méd. Vét.*, 20 (1912), No. 237, pp. 465-473).—This discusses the pulmonary, alimentary, and bucco-pharyngeal modes of infection in tuberculosis. It also deals with their relative importance in regard to the occurrence of this disease.

Curative and protective vaccination against human tuberculosis, F. F. FRIEDMANN (*Berlin. Klin. Wchnschr.*, 49 (1912), No. 47, pp. 2214-2217; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1912), No. 9, pp. 770-772).—A very general statement as to the cultures used, their virulency, and the number of adults (1172) and children (335) treated by the vaccine. A discussion of the method by others and the results obtained is included.

Tuberculosis in man and bovines in Sardinia, M. JATTA, G. LORINGA, and R. MAGGIORA (*Abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1912), No. 9, pp. 772, 773).—The thesis of this work was to determine whether the organism causing human tuberculosis was identical with that producing tuberculosis in bovines; furthermore, if the bovine type of bacillus was capable of producing the disease in man. After reviewing R. Koch's theories with reference to tuberculosis and discussing the present views in regard to the types of organisms from the standpoint of bacteriology, anatomy, and epidemiology, the authors report negative results from examining 231 samples of cows' milk for the presence of the tubercle bacillus. Tests with reference to the behavior of the bovine tubercle bacillus in bovines of a Sardinian breed, showed that the local breeds had a greater resistance toward the bovine tubercle bacillus than the Swiss breeds or crosses.

Following this are data showing the isolation of 110 strains of tubercle bacilli from man, which were tested on bovines, rabbits, and guinea pigs. The strains with 4 exceptions were of the human type. The 4 strains, which were atypical, were found later to be nonpathogenic for bovines.

As a result of the tests the authors believe that we can not obtain any information as to the frequency of tuberculosis in man from the number of cases noted in bovines. Diseased animals are not frequently found in Sardinia. Man is evidently the chief source of infection for man.

Bovine tuberculosis investigations, C. M. HARING (*California Sta. Rpt.* 1913, pp. XXXV-XXXVIII).—In tests of von Behring's bovovaccine, 45 calves were used, 22 of the animals being treated with bovovaccine and the remaining 23 animals being kept as controls. During the following year the calves were reared with precautions against tuberculous infection, and at the end of 8 months the animals were tested with tuberculin, with negative results in all cases. The calves were then pastured and fed in corrals with 5 cattle having open tuberculosis. All these cows died within 6 months, and were replaced by other tuberculous animals. The test animals were slaughtered when about 3 years old and given an autopsy under federal inspection. Of the 22 vaccinated cattle 10 were tuberculous, as compared with 14 of the 23 nonvaccinated animals.

The conclusions are "that some immunity was produced by the use of bovovaccine, but that this immunity did not remain to any appreciable extent after the third year. We can not recommend the use of bovovaccine to stock owners."

Data were collected as to the use of tuberculin in the diagnosis of tuberculosis in cattle as shown in over 4,000 tests. The most valuable material was that on the retesting of recently tuberculinized cows. Some experiments were undertaken to verify Vallée's procedure for retesting cows 48 hours following a previous injection of tuberculin (E. S. R., 16, p. 510). It had been previously observed that sometimes tuberculous cattle would not react to a double dose of tuberculin on retest, even after a period of 3 months, this failure to react being especially frequent in nonlactating cows, i. e., those that had been purposely dried up and segregated because of the fact that they had reacted. When opportunity was afforded to autopsy such cows, the lesions were sometimes found encapsulated, but in 6 instances active tuberculosis had been proved, 2 of which were also proved to have excretions virulent to guinea pigs.

The test was made on 37 cows in full lactation. "In corroboration of Vallée's observations, in the retests made within 5 days the animals reacting to the second injection usually had a rise of temperature sooner than at the first test, but the only conclusion to be drawn is that the retesting of cattle within 6 weeks is not satisfactory, even when a double dose is used, and the temperature taken every 2 hours from the time of injection until the eighteenth hour."

In another instance 20 reacting dairy cows were removed from a dairy, dried up, and turned into a mountain pasture. When retested several months later 18 of these 20 failed to react. It is not believed that the cows were cured, but that rather the possibilities still exist that they may eliminate tubercle bacilli and become a menace to younger susceptible animals. The author therefore believes that no retests should be permitted.

The history of tuberculosis in the college herd, H. H. HAVNER (*Pennsylvania Sta. Bul.* 123, pp. 3-20, figs. 5).—This deals with the history of tuberculous animals in the herd of the Pennsylvania Station. The first tests were made in 1892, with no reactions. In 1906 there were 20 reactions in the herd; in 1907, 1 reactor; in 1908, 4; in 1909, none; in 1910, 5; in 1911, 12; and in 1912, 13 reactors. Following each of the tests the reactors were at once placed in quarantine away from other animals or immediately slaughtered under inspection.

Records were kept of the 5 animals of the quarantine herd in 1910 as to the general health and condition of each individual until disposal; their behavior when subjected to the tuberculin test semiannually; their transmission of the disease to healthy animals under open-air conditions; and the post-mortem findings. In most instances the animals of 1910 took on flesh and when slaughtered were in very good condition. In the pre- and postinjection protocols no typical reaction was noted at the outset, but semiannual retests in some cases gave more specific reactions. Six healthy calves kept with the quarantine animals for from 5 weeks to 3 months were found free from tuberculosis upon slaughter. The post-mortem findings of all the animals are given.

Tests made with beef breeding cattle kept in open sheds in winter and in the pasture in summer during the last 2 years have failed to reveal any tuberculous cattle. The beneficial effect of light, ventilation, and good feed as an aid in preventing tuberculosis is considered, and the effect of constitutional disorders and the presence of other tuberculous animals in the herd in favoring the disease are pointed out. The application of the tuberculin test and the disinfection of barns are discussed, with recommendations.

The sanitary police and the prophylaxis against bovine tuberculosis, L. DESLIENS (*Rev. Gén. Méd. Vét.*, 21 (1913), No. 243, pp. 109-123).—This is a discussion of the numerous factors concerned in the prophylaxis against this disease and the elimination of tubercular cattle from dairy herds.

About the treatment of tuberculosis in bovines with Tuberculosan, T. FLEISCHHAUER (*Ueber Behandlungsmethoden der Rindertuberkulose mit besonderer Berücksichtigung des Tuberkulosan-Burov. Inaug. Diss.*, Bern, 1911, pp. 32; *abs. in Hyg. Rundschau*, 22 (1912), No. 17, p. 1120).—The greater part of this material has been noted from another source (*E. S. R.*, 26, p. 681).

Histological studies of actinomycosis of the bovine, E. JOEST and A. ZUMPE (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 13 (1913), Nos. 1-2, pp. 8-58, pls. 5; 3-4, pp. 105-140, pls. 3).—This first paper deals with actinomycosis of the tongue and lymph glands. A bibliography of some 54 titles is included.

Anaplasmosis in cattle in South America, LIGNIÈRES (*Rev. Assoc. Rural Uruguay*, 41 (1912), No. 9, pp. 684-686; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 2, pp. 256, 257).—Anaplasmosis in South America is said to be a far more serious disease than is piroplasmosis, most of the infected cattle dying, sometimes after resisting the disease for some weeks or months. Whether or not the parasite is identical with *Anaplasma marginale* remains to be determined. It is stated that under natural conditions this *Anaplasma* is associated with *Piroplasma bigeminum* and sometimes with *P. argentinum*.

Cattle dipping at short intervals, H. E. LAWS (*Agr. Jour. Union So. Africa*, 5 (1913), No. 6, pp. 871-879).—"The conclusions to be drawn from these experiments are that it is possible to spray or dip cattle every 4 days with an emulsion containing arsenious oxid in the proportion of 1:800 without causing any injury to the cattle, and it is also possible to spray or dip cattle every 5 days with an emulsion containing arsenious oxid in the proportion of 1 part emulsion to 600 parts water without any ill effects whatever. Further, with 4-day spraying cattle can be kept practically free of ticks, although they may be running on grossly infested pasturage alongside nondipped heavily infested cattle which are kept there to maintain the infestation of the paddock.

"Spraying at the 5 days' interval gave satisfactory results with the stronger of the 2 solutions, but was not so satisfactory with the weaker dip."

The tick-killing properties of sodium arsenate, H. E. LAWS (*Agr. Jour. Union So. Africa*, 5 (1913), No. 6, pp. 915-921).—This paper reports experiments conducted in continuation of those previously noted (*E. S. R.*, 20, p. 680).

It is stated that since very little oxidation takes place in a dipping vat which is constantly in use the strength of the dip in the tank can be maintained by putting cattle through it at regular intervals, thus supplying reducing bacteria to counteract the effect of oxidizing bacteria which do not die out in the tank. There is said to be very little difference between the activity of arsenate of soda at a strength of 1:150 and arsenite at a strength of 1:300.

How ticks are killed when cattle are dipped, H. E. LAWS (*Agr. Jour. Union So. Africa*, 6 (1913), No. 1, pp. 49-54).—The author finds that arsenical dips do not act through being absorbed by ticks through the skin while the animal is passing through the dipping vat or after dipping, but that the host absorbs the poison into its skin and the tick imbibes it with juices extracted from its host.

Cysticercus ovis, the cause of tapeworm cysts in mutton, B. H. RANSOM (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1913), No. 1, pp. 15-58, pls. 3, figs. 13).—This is a detailed report of investigations, a preliminary account of which has been previously noted (*E. S. R.*, 28, p. 680). A historical summary first presented is followed by a report of life history investigations, a description of the

sheep-measle parasite, remarks on morphology and comparison with other species, distribution in the body, diagnosis of sheep measles, geographic distribution, prevalence, economic importance, significance in meat inspection, prophylaxis, etc.

Sheep measles, or tapeworm cysts in mutton, were first recorded in England in 1866, and the parasite named *C. ovis* in 1869 by Cobbold. *C. ovis* has usually been considered identical with *C. cellulosa*, the pork-measle parasite, and has also been confused with *C. tenuicollis*. It is, however, the intermediate stage of a dog tapeworm, *Tania ovis*. It may attain its full development in sheep in less than 3 months after infection and in the dog the tapeworm may reach the egg-producing maturity in 7 weeks after the ingestion of the cysticercus.

"*C. ovis* is commonly limited to the heart or diaphragm, but not infrequently occurs in the muscles of mastication and tongue and sometimes in various locations in the musculature. It may occur in the lungs, the wall of the esophagus, or the wall of the stomach. Doubtful locations are the kidney and liver. It is essentially a parasite of the intermuscular connective tissue and is evidently rare in other locations. The cysticerci seen by meat inspectors are usually degenerated. Those located in the heart tend to degenerate early. Degeneration may be well established in less than 3 months after infection. Either partially grown or fully developed cysticerci may degenerate and may be associated with living cysticerci in the same carcass as a result of variations in longevity of the parasites or of repeated infections.

"There is no known method of diagnosing the presence of *C. ovis* in the living animal. The parasites are to be recognized in the sheep carcass by their location in the musculature, by their small size, and by the lateral position of the head of the cysticercus, *C. tenuicollis* being found in relation with serous membranes, being of larger size when fully developed than *C. ovis*, and having its head in an apical position with reference to the caudal bladder. In some cases microscopic examination may be required to differentiate between these 2 species. The possibility exists of confusing degenerate cysticercus cysts with *Sarcocystis* cysts and with encysted foreign bodies, such as plant barbules."

Sheep measles probably occurs wherever sheep are attended by dogs, but has not yet been found in sheep known to have originated in the eastern United States. "Over 17,000 of the sheep slaughtered under federal supervision during the year 1912, prior to December 1, were found to be affected with measles. With the development of more efficient methods of inspection for *C. ovis* the number of cases detected will be relatively much more numerous. The number of infested sheep in the Western States probably exceeds, on the average, 2 per cent of the total number. Young sheep, not over 2 years of age, apparently are more likely to show infestation than old sheep.

"*C. ovis* is of economic importance, first, because of the losses resulting from the condemnation of carcasses found by the meat inspector to be more or less heavily infested, and, second, because of the direct losses which probably occur among sheep as a result of the invasion of the parasites. The extent of these losses can not be estimated at present.

"*C. ovis* is of special interest in meat inspection because it affects the musculature and because it is so prevalent. Carcasses which are only slightly infested may properly be passed for food after the removal of the parasites, but carcasses showing a heavy infestation should be condemned. Moderately infested carcasses may be rendered into edible tallow, but are usually treated the same as condemned carcasses and are manufactured into fertilizer and other inedible products. As *C. ovis* is not transmissible to man, meat-inspection

regulations concerning it need not be so stringent in certain respects as those governing beef measles or pork measles.

"The length of time *C. ovis* may survive after the death of its host has not been determined.

"The most important preventive measures against the infestation of sheep with *C. ovis* consist, first, in destroying by fire the carcasses of dead sheep on the farm or range so that they may not be devoured by dogs or wolves, and, second, in keeping dogs free from tapeworms by systematic medicinal treatment. These measures will also protect sheep from infestation with tapeworm cysts of various other kinds which they acquire from dogs."

A bibliography of the literature relating to the subject is appended.

The pathogenesis and pathological histology of intestinal anthrax in swine, C. NIEBERLE (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 14 (1913), No. 1, pp. 41-67, pls. 5).—This is a contribution from the Laboratory of Foreign Meat Inspection in Hamburg.

Detecting the presence of erysipelas in hogs with the aid of Ascoli's thermo-precipitation reaction, E. SEIBOLD (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 13 (1913), No. 1-2, pp. 91-104).—The organs, blood, etc., coming from 43 pigs dying shortly after vaccinating against erysipelas, and 3 pigs sent in to the Bacteriological Institute of the Agricultural Chamber at Halle, were used for microscopical and autopsical examination and the precipitation test. In addition, 1 sound mouse and other mice infected with the *Bacillus rhusiopathiae suis* were examined.

In the organs of the 3 pigs sent in for diagnosis, the swine plague bacterium was present. Among 25 cases in pigs where the *erysipelatis* was positively identified by the bacteriologic test, the precipitin reaction failed in 4 instances. In 15 other cases where a positive diagnosis with putrid material could not be established, it showed positive 3 times. A positive reaction was also obtained with the putrid tissues of the healthy mouse. The question arose whether putrid material which has no erysipelas bacteria present could give a positive reaction.

In 6 cases where the bacteriologic examination showed the presence of the swine plague bacterium, 3 gave a positive precipitin reaction. It was not possible to determine whether the reaction was produced by the swine plague bacillus or the products of putrefaction.

Most of the precipitin tests were conducted with extracts of the spleen or kidney, and where the reaction appeared very distinct in one organ extract it was not always marked in the extract from the other organ. The time for the appearance of the reaction also varied.

Hog cholera and preventive serum, W. M. BURSON and H. H. ROTHE (*Bul. Ga. State Col. Agr.*, 1 (1912), No. 1, pp. 22, figs. 19).—This is a popular account of hog cholera and the methods of production and use of antihog cholera serum.

The antihog cholera serum laboratory, T. F. HUNT (*California Sta. Rpt.* 1913, pp. XXIII-XXVIII).—From July 1, 1912, to June 30, 1913, this laboratory distributed 1,350,235 cc. of serum and 17,528 cc. of virus, which were used to immunize 52,300 hogs, as compared with 20,450 hogs for the previous year. Of the total number of hogs 67,257 showed no visible symptoms at the time of injection, and 95.3 per cent of these survived. Of the remaining 5,492, which showed visible symptoms of cholera when injected, 36.1 per cent survived.

"Hog cholera was epidemic in the immediate vicinity of 98.2 per cent and actually present on 96.6 per cent of all the ranches on which our serum was used. . . . The cost of the serum to farmers, in addition to that distributed free as provided by law, has been about \$33,000. . . . The protection provided . . .

has meant a saving to the ranchers of at least \$240,000. This does not include the profits resulting from the breeding and profitable feeding of the hogs saved."

Tables are also given which show the comparative success of the treatment on the uninfected and infected ranches and the results of the different methods of treatment recommended by the station. The unsatisfactory results obtained with the serum by some owners are also detailed, and critically discussed. The reasons ascribed are incorrect diagnosis, the use of serum alone in cases where serum and virus should have been employed, and vice versa, and finally the use of spoiled serum and virus.

Hog cholera and its prevention, R. P. MARSTELLER (*Texas Sta. Bul.* 157, pp. 7-19, figs. 10).—This is a popular account in which are considered the symptoms, susceptibility, mortality, dissemination, use of serum for prevention, and prevention of spread of the disease.

A new cylicostome worm from the horse in London, R. T. LEIPER (*Vet. Jour.*, 69 (1913), No. 469, pp. 460-462, fig. 1).—The name *Cylicostoma mettami* is given to a new nematode parasite of the horse.

Some experiments on medical treatment of coccidiosis in chickens, K. F. MEYER and W. J. CROCKER (*Amer. Vet. Rev.*, 43 (1913), No. 5, pp. 497-507).—A report is given of investigations conducted during an outbreak of this disease on a poultry farm, in which chicks from 6 to 8 weeks of age died at the rate of 150 per day and several old hens succumbed. It is stated that approximately 1,800 chicks were lost in from 2 to 6 weeks.

Therapeutic treatments with various medicinal agents are reported upon. The experiments indicate that calomel and methylene blue are capable of prolonging life but whether or not they are distinctly parasitotropic has yet to be determined.

"The entire endemic of avian coccidiosis was eradicated by simple isolation, cleaning, and disinfection, the most dependable treatment available until the future presents more efficient parasitotropic measures."

RURAL ENGINEERING.

Message of the governor of Porto Rico [regarding irrigation], G. R. COLTON (*San Juan*, 1913, pp. 25+23, pls. 2).—This message, in both English and Spanish, suggesting and recommending the raising of funds for the completion and satisfactory operation of the irrigation works in Porto Rico, relates the history of irrigation on this island and describes the irrigation district and unfinished and proposed works. The district contains 43,000 acres of irrigable land and has 3 storage projects with a combined capacity of 33,264 acre-feet.

Many novel irrigation and other engineering features are included in the works, among which is a combined cut and tunnel conveying irrigation water through the mountains, 4,046 ft. in length and so located as to give an abrupt fall of 1,500 ft. to the water, thus developing over 2,000 electrical horsepower. The total cost of construction is estimated at \$4,000,000.

Irrigation and flood protection, Papago Indian Reservation, Arizona, C. R. OLBERG and F. R. SCHANCK (*U. S. Senate*, 62. Cong., 3. Sess., Doc. 973, 1913, pp. 32, pls. 19).—This report, which includes maps, plans, and estimates of cost, proposes a system of water development and a distributing system for the irrigation of about 3,000 acres of Indian land and a permanent system of protective works to stop erosion and damage to irrigable lands by floods at an estimated cost of \$150,000. It is further estimated that the annual cost of maintenance for the system will amount to \$15,605, or approximately \$5 per acre when working at its maximum capacity.

Swampy lands. R. DUMONT (*Les Sols Humides. Paris [1909], pp. 183, figs. 52*).—This book calls attention to the extent of waste swampy areas and peat bogs in various countries, especially in France, and endeavors to point out their agricultural value if properly drained, freshened, and fertilized. A general discussion of the vegetation of swamp and peat lands, the physical formation of peat bogs, and the possibilities of putting such lands to practical use in their natural state is followed by a description of methods with costs of draining and freshening swamp and waste lands, including drainage and irrigation combined as a means for preventing the rise of injurious salts in the soil. The sanitary value of draining swamp lands is brought out and several examples of profitable land drainage in European countries are noted. The physical and chemical properties and compositions of various kinds of peat soils are discussed, and in connection with the improvement of peat lands the effects of various methods of drainage and various fertilizers are described. The crops appropriate for peat soils are pointed out and several examples of profitable improvement of peat bogs in France are noted.

It is stated in conclusion that if the chemical composition of swamp soil is relatively good, and the expense of drainage, freshening, and fertilization does not exceed 250 francs per hectare (about \$20 per acre), the reclamation and improvement of such land may be profitably undertaken.

Public road systems of foreign countries and of the several States (*Washington, D. C.: 63. Cong., 1. Sess., 1913, pp. 198; [App.] Good Roads Chart, rev., pp. 3, tables 5*).—This is a report prepared under the direction of J. Bourne, jr., and printed for the use of the Joint Committee on Federal Aid in the Construction of Post Roads, which reports on the highway systems of the leading nations of the world and gives a comparative analysis of their most important features. A synopsis of the various state laws relating to road construction by the aid of state appropriations is given, together with reports showing memoranda on the cost of road construction and maintenance in several of the States.

A memorandum by L. W. Page is included concerning the scope and activity of the Office of Public Roads of this Department. In addition a public roads chart is given under separate cover containing tables of data on the salient features of foreign road systems and those of the several States, and the cost of road construction in the various parts of the country.

Strength of materials, H. E. MURDOCK (*New York and London, 1911, pp. XIV+308, figs. 151*).—The aim of this work is to make intelligible the fundamental principles of the strength of materials without the formal use of calculus. A chapter is included, however, giving the derivation of the elastic curve of beams by the calculus method in which an attempt is made to give the physical conception of the constants of integration rather than to treat them simply as mathematical symbols. A chapter on graphic integration is included and a graphical method of determining the deflection of beams is utilized.

The remaining chapters are as follows: Materials of construction; direct stresses; direct stresses, applications; riveted joints; beams (external flexural forces); beams (internal flexural stresses); stresses in such structures as chimneys, dams, walls, and piers; deflection of beams; elastic curve (cantilever and simple beams and beams fixed at both ends); elastic curve (overhanging, fixed and supported, continuous beams); secondary stresses; columns and struts; torsion; repeated stresses, resilience, hysteresis impact; and centroids and moments of inertia of areas.

Experiments on the action of various substances on cement mortars, R. K. MEADE (*Engin. Rec., 68 (1913), No. 1, pp. 20, 21; Engin. News, 70 (1913), No. 1, pp. 21-23; Cement Era, 11 (1913), No. 7, pp. 40, 41; Proc. Am. Soc. Test. Mat.,*

13 (1913), pp. 813-820).—In this paper, read before the American Society for Testing Materials, the author gives the results of 5 or 6 years' experiments on the action of the salts in alkali waters and of various oils on cement concrete. In these, 1:3 sand briquettes of normal Lehigh Valley cement were immersed in 1 per cent solutions of the various salts, among which were sodium chlorid, magnesium sulphate, calcium sulphate, sodium sulphate, and sodium carbonate, for periods ranging from 7 days to 2 years.

The results indicate that even very dilute solutions of the salts of magnesium and the sulphates in general have a destructive action on concrete. Further tests of the generally proposed remedies to prevent such action indicate that they do not appreciably retard it. The results in general, however, indicate the desirability of employing low alumina cements in concrete structures subject to such destructive action.

Experiments by immersing the briquettes in engine oil, cylinder oil, and black mineral oil showed no harmful results with the first 2 oils, but a complete disintegration of the briquettes occurred in the black oil after being immersed between 6 months and 1 year.

Flow of water in pipes, W. L. DURAND (*Power*, 38 (1913), No. 1, p. 20, fig. 1).—A set of curves on logarithmic paper is given showing the relation between quantity of water, friction head, and size of pipe. The curves may be reduced to the formula $V=0.4 d^{2.64} h^{0.53}$, from which the following formulas may be derived: $V=0.327 d^2 v$, $v=3.06 \frac{V}{d^2}$, $h=\frac{0.69 v^{1.89}}{d^{1.21}}$, and $d=\frac{0.73 v^{1.56}}{h^{0.83}}$, in which V =cubic feet per minute, v =velocity in feet per second, h =friction head in feet per 100 ft., and d =actual internal diameter of pipe in inches.

Windmills in India, H. D. BAKER (*Daily Cons. and Trade Rpts. [U. S.]*, 16 (1913), No. 172, pp. 489-491).—Attention is called to the open field for the profitable employment of windmills in lifting water for irrigation in India. From results of experimental work in Madras by A. E. Chatterton it is stated that American windmills are not strongly enough constructed for work in India, the most serious defects, aside from minor breakages, being due to the poor fitting of the valve in the pump chamber. Much trouble would be obviated if the pivots on which the flap valves turn were made larger and fitted into better designed sockets.

A 16 ft. windmill, mounted on a 40 ft. tower and fitted with an 8 in. pump, will cost, when erected over a well, about \$500. Assuming the cost of maintenance at \$1.75 per month, 6 per cent interest on the capital expended, and 10 per cent for depreciation, the total cost of operation is \$8.41 a month. Such a plant will do the work of 2 pairs of cattle, and if fitted with 2 pumps will be equivalent to 3 pairs of cattle.

The principles of fuel oil engines, C. F. HIRSHFELD (*Sci. Amer. Sup.*, 76 (1913), Nos. 1959, pp. 46, 47, figs. 5; 1960, pp. 61-64, figs. 9; 1961, pp. 74, 75).—This paper, read before the American Society of Agricultural Engineers, deals with the chemical and physical basis of the operation of fuel oil engines. A review of certain physical phenomena, including evaporation, vaporization, and boiling, is followed by a consideration of fuels which are either complex mixtures of hydrocarbons of widely differing properties or are less complex distillation products made therefrom.

Vapor pressure curves are given for a number of pure hydrocarbons and for gasoline and kerosene of 66° and 45° B. gravities, respectively. The gasoline curve indicates the boiling point under atmospheric pressure at a temperature of 145° F. but the kerosene curve indicates that at 175° the vapor pressure of this fuel is only about 0.14 atmosphere. Other curves are given showing the

specific volumes and temperatures of saturated vapors of hydrocarbons and the volumes of air required for the combustion of different hydrocarbons and gases. Distillation curves showing the complexity of commercial products and crude oil, and products prepared therefrom, are given. A consideration and comparison of the various methods of utilizing liquid fuels in internal combustion engines indicate that extremely fine spraying will not only increase the rate of evaporation but also will so reduce the size of any drops of liquid which remain at the time of combustion that there can be no appreciable amount of so-called cracking and consequent formation and deposition of carbon before they are completely vaporized and burnt.

Attention is called to the handicapping property of kerosene in that it is apt to form vapors which will ignite at low temperatures, causing preignition. In addition it is stated that kerosene engines adjusted to run smoothly at low and medium loads will pound at high loads.

Experiments indicate that the use of water in kerosene and other oil engines materially improves operating conditions but that the behavior of water under these circumstances is very complicated and depends largely upon the quantity, which for proper results must vary with, but not as, the load, with the size of engine, cylinder dimensions, clearance, degree of compression, speed, average temperature maintained in the metallic parts, and the method and time of introducing the fuel.

Oil for internal-combustion engines (*Power*, 38 (1913), No. 1, pp. 15, 16).—Data on the present oil situation are followed by specifications for oil engine fuels and lubricating oils taken from a report by I. C. Allen and presented before the American Society of Mechanical Engineers.

Pressures in gasoline engines, G. A. FIELD (*Power*, 38 (1913), No. 2, p. 56, fig. 1).—Curves are given showing variations in percentage of clearance, compression pressures, and temperatures, and normal explosion pressures.

The motor and the dynamo, J. L. ARNOLD (*Easton, Pa., and London, 1913*, pp. V+178, figs. 166).—This work, intended for the student and practical electrician, deals with the theory and practical application of both direct and alternating current machinery. The mathematical principles underlying the theory of the operation of electrical machinery are presented and additional chapters are given on the dynamo machine, operation and characteristics of the direct current dynamo, the direct current motor, the alternating current and its measurement, and alternating current machinery.

Practical power for the brick industry and for threshing, CHARBONNIER (*Maschinen Ztg.*, 11 (1913), No. 8, pp. 89-93).—Working data are given from comparative service tests of saturated and superheated steam engines, gasoline and kerosene internal combustion engines, and electric motors working in brick plants and at threshing for annual working periods of 75, 150, 225, and 300 days under the two average power requirements of 16 and 22 h. p. Under all these conditions and for both uses the steam engine is considered the most economical when the utilization of exhaust and other heat losses is taken into account, and can be surpassed by the electric motor only in case the annual working period is short and the cost of electric current very low.

The care and use of agricultural machinery, HOLLDACK (*Flugschr. Deut. Landw. Gesell.*, 1913, No. 16, pp. 57, figs. 28).—A general discussion of permissible speeds of operation, setting-up, and adjustment of machinery, drive belts and chains, lubrication, annual inspection and repair, and protection from the weather is followed by directions for the proper care and use of plows, harrows, rollers, wagons, manure spreaders, drills, mowers, hay rakes and tedders, elevators, threshing machines, grain cleaning machines, feed cutters, feed

grinders, grindstones, cream separators, line shafting, steam boilers and engines, and internal combustion and electric motors.

Facts and figures on the oil tractor for the farm, A. G. BARNET (*Gas Engine*, 15 (1913), No. 7, pp. 379-381, figs. 5).—Tests on level ground gave the following drafts per square inch of cross section of plow, the cross section being taken equal to the plow width times the depth plowed: Sandy soil, 3 lbs.; clay soil, 8 lbs.; clover sod, 7 lbs.; virgin sod, 15 lbs.; prairie sod, 15 lbs.; and gumbo soil, 20 lbs. It is said that each 1 per cent rise in grade adds 1 per cent of the weight of the tractor and plows to the draft.

The theory of centrifugal pumps, R. L. DAUGHERTY (*Power*, 38 (1913), No. 3, pp. 79-83, figs. 10).—This article discusses the various divisions of head entering into the operation of a centrifugal pump and deals both mathematically and graphically with the characteristics of both turbine and volute pumps.

Test of a two-stage turbine pump, A. A. POTTER and W. W. CARLSON (*Power*, 38 (1913), No. 3, p. 83).—A two-stage turbine pump was tested on an irrigation project in western Kansas at an elevation of 2,850 ft. Water was found at a depth of 65 ft. but in order to eliminate some of the difficulties encountered the pump was set at a depth of 123 ft. Power was supplied by a 16×24 single cylinder, 4 cycle oil engine, using a 42° B. oil. The pump was run at nearly 800 r. p. m. during the test and the water was measured by means of a trapezoidal weir, all measurements being checked with a pilot tube.

The resulting data indicate that for every gallon of fuel used, 5,400 gal. of water was pumped, or with oil at 3 cts. per gallon, 1,800 gal. for 1 ct. There was pumped per minute 617.5 gal. of water at an expense of about $\frac{1}{3}$ ct.

Test of a row and broadcast seed drill, E. GIESELER (*Maschinen Ztg.*, 11 (1913), No. 1, pp. 1, 2, figs. 8).—The drill has 11 seed droppers and has a working width of 2 meters. It was first calibrated by means of an electric motor which operated the mechanism at an approximate speed of 3 ft. per second. It was then operated on both level and hilly land, the seed used being wheat, rye, oats, corn, beet seed, beans, and peas.

The seeds were sown without injury. It was found that on level ground the machine sowed within 1.3 to 1.7 per cent of the required amount of wheat, rye, and oats; within 1.9 to 2.9 per cent of the required amount of corn; and within 2.9 to 3.48 per cent of the required amount of beet seeds and peas. The total quantity of seed sowed increased on an upgrade and decreased on a downgrade, the increase or decrease for each per cent rise or fall in grade being for wheat, rye, oats, and corn, respectively, 0.15, 0.28, 0.31, and 0.95 per cent. In comparison with several other seed drills tested this drill gave the best distribution of seed.

It is concluded that this drill is fitted for both flat and hilly land. It is in all parts very durable, the operation is simple, and the adjustments may be made in less than a minute. It is very accurate in amount of seed sowed and in seed spacing.

Steam pipes in dairies (*Molk. Ztg. [Hildesheim]*, 27 (1913), No. 12, pp. 219, 220).—Attention is called to the important points in the installation of steam pipe systems in dairies, dealing with saturated, superheated, and exhaust steam. Tables of data are given relative to steam pipe sizes for various boiler pressures and amounts of steam consumed, expansion of steam pipes, and condensation losses.

Electrical engineer's pocketbook, H. A. FOSTER (*New York*, 1913, 7. ed., rev., pp. XXXVI+1599, illus.).—This is a handbook of useful data for electricians and electrical engineers.

RURAL ECONOMICS.

Rural economics and rural sociology, J. PHELAN (*Eau Claire, Wis., 1913, pp. 43*).—The author has endeavored to bring together in this volume some of the general principles of rural economics and rural sociology. It is designed primarily for the use of teachers in rural schools who have not had previous training in general economics and sociology.

A suggested solution of the rural problem, H. PLUNKETT (*Irish Homestead, 20 (1913), No. 29, Sup., pp. 32*).—This is an address delivered before the American Commission on Rural Credit and the Organization Societies of England, Scotland, and Ireland at Dublin, Ireland, July 12, 1913, in which the author outlines briefly the experience of Great Britain, with special reference to Ireland, in trying to solve the problem of rural reconstruction, and makes suggestions as to what is necessary to perfect its solution.

The rural problem, or why farmers should organize and stay organized, J. Z. GREEN (*Charlotte, N. C., 1912, pp. 32, fig. 1*).—This pamphlet contains a series of articles showing the economic advantages of cooperative effort generally and advocating the organization of farmers into local unions for the purpose of so curtailing the production of crops for the market so as to keep up a strong demand and to control the supply in such a way as to meet the actual demand. It is pointed out that the organization should also provide for the establishment and maintenance of a cooperative system of marketing, buying, etc.

Marketing and farm credits (*Proc. Nat. Conf. Marketing and Farm Credits, 1 (1913), pp. X+232*).—The proceedings of the First National Conference on Marketing and Farm Credits, Chicago, April 8-10, 1913, are presented in this volume. Among the papers read and discussed the following may be noted: Waste in Distribution, by C. R. Van Hise; Distributing Food Products, by E. M. Tousley; Educational Aids to Organization, by H. J. Waters; Educational Aids to the Marketing of Farm Products, by S. E. Mezes; Beef Growers' Organization in Iowa, by R. Beresford; Dairy Organization, by E. H. Webster; Organization of Cotton Growers, by E. W. Kirkpatrick; Farmers' Selling Agencies, by L. S. Tenny; A Plan to Sell the Cotton Crops, by W. B. Yeary; Grain Marketing Problems, by M. R. Myers; Selling Dairy Products, by N. P. Hull; The Arkansas Plan of Marketing Farm Products, by H. S. Mobley; Relations of the Government, Agriculture, and the Railroads, and Their Bearing upon Better Marketing, by B. F. Yoakum; Railroad Aids to Marketing Farm Products, by W. R. Beattie; Financing the Farmer, by W. G. Edens; Cooperative Finance for American Farmers, by H. Myrick; Improving Farm Credits in America, by B. F. Harris; and Cooperation among Jewish Farmers, by G. W. Simon.

The practical application of agricultural credit systems to American farm and market problems, J. J. DILLON (*N. Y. Dept. Agr. Bul. 47, 1913, pp. 1227-1238*).—This paper presents a practical discussion of the necessity for a special system of agricultural credit in the United States, reviews agricultural credit systems as they exist in other countries, and suggests in a general way plans for use in this country.

The mortgage bank principle as operated in Switzerland seems to the author to be a practical and feasible means for supplying the credit needs of the American farmer. The principle as outlined consists in the borrower making a written application for a loan in which he gives a detailed description of the farm he offers as security and also information as to his own antecedents and conditions. The application is forwarded to the canton officials, for con-

firmation before the bank makes the loan. In case the borrower fails to keep up his payments the bank may recover any losses from the canton due to misrepresentation by the canton officials. It is noted, however, that losses in this way are very rare and that the method seems to be cheaper and more efficient than those pursued in a number of other systems.

"Cheap money" commission reports (*Grain Growers' Guide*, 1913, Oct. 29, pp. 7, 18, 19, fig. 1).—This article points out and discusses the principal features of the report of the commission appointed by the Saskatchewan Government to study and report on agricultural credit systems in Europe. The chief recommendations for providing farmers in the Province with credit are legislation facilitating cooperative purchasing and marketing by farmers; the Government to guaranty bonds of cooperative farm mortgage associations, for loans to farmers at low rates on long terms and be repaid on the amortization plan; and the establishment of an agricultural bank by a cooperative farm mortgage association.

Progress of the international postal savings banks and the interests of agriculture (*Internat. Inst. Agr.* [Rome], *Mo. Bul. Econ. and Soc. Intl.*, 4 (1913), No. 8, pp. 83-125).—This article discusses and illustrates the origin, development, and advantages of the postal savings banks in the various countries of the world, showing at length their economic organization, rules regarding deposits, interest, and withdrawals, and the investment of savings collected, with special reference to that part of the fund employed for the benefit of agriculture.

Agricultural cooperation in Argentina, C. D. GIBOLA (*X. Cong. Internat. Agr. Gand*, 1913, Sect. 1, pp. 34).—This publication presents a brief history of what has been done in a legislative way to encourage agricultural cooperation in Argentina and the effect of such legislation, progress made in cooperation, and its present status.

Land reform, occupying ownership, peasant proprietary, and rural education, J. COLLINGS (*London, New York, and Bombay*, 1906, pp. XXIV+452, pls. 6).—The author reviews the causes leading up to the present system of land tenure in England and submits a scheme which seeks by state aid to reorganize the agricultural industry in such a way as to give better opportunities to yeoman farmers and peasant proprietors. He describes the provisions of the Land Purchase Bill and points out how it would affect the various interests concerned.

[Collective or cooperative renting], B. RAMBAUD (*Ann. École Nat. Agr. Grignon*, 3 (1912), pp. 107-135).—This article presents a comprehensive study of the systems of renting followed in Italy, Roumania, Austria-Hungary, and Servia, showing reasons for the movement in various sections to eliminate the system of renting land through monopolistic combinations and substitute therefor collective or cooperative renting. Data are given showing in detail the work and progress of the collective system and to what extent it has been successful in supplying work for the unemployed.

Danish small holdings, R. A. LISTER (*Cheltenham, England*, 1909, pp. 35, pls. 3).—This book records the findings of a special study of agricultural conditions in Denmark, especially as regards small holdings and the Danish system of education and their part in the development of Danish agriculture during the last 30 years.

Registering title to land, J. DUMAS (*Chicago*, 1900, pp. 106).—This volume presents a series of lectures in which the author summarizes the general history of public registration of land titles in other countries, and points out the merits of the Torrens system as compared with those of recording the conveyances under which title may be claimed.

The employment of white labor in the sugar plantations of Queensland, J. W. GREGORY (*Proc. Roy. Phil. Soc. Glasgow*, 43 (1911-12), pp. 182-194).—The author maintains that the facts do not warrant the conclusion that climatic and economic conditions practically exclude white labor from the cane fields, and that the work can be done better and more profitably by white labor.

Comparison and importance of agriculture, commerce, and industry in various countries (X. *Cong. Internat. Agr. Gand*, 1913, *Sect. 1*, pp. 108+[251]).—This volume embodies a number of reports presented at the Tenth International Congress of Agriculture at Ghent, 1913, showing by way of comparison the importance and progress of agriculture, commerce, and industry in the different countries. The reports are in response to a questionnaire making inquiry as to the area under crops, the character and number of live stock, means of impeding the exodus from the country, character and influence of education, result of efforts to bring immigrants from cities to the country, establish small farms, and make land accessible to agricultural laborers, the facilities for agricultural credit, the character, growth, and influence of cooperative societies, etc.

The agricultural outlook (U. S. Dept. Agr., *Farmers' Buls.* 558, pp. 20; 560, pp. 29).—The first of these publications presents notes and statistical tables furnished by the various bureaus of the Department on weather conditions and the general outlook as to various crops during August. Comparisons are made with conditions, prices, and yields of former years, and for the 10-year average yield per acre, 1903-1912. The work of the Department to eradicate hog cholera is also explained and brief suggestions given for handling the disease.

Notes and statistical data are presented in the second publication showing the condition of all crops on October 1, 1913, with comparisons for 1912 and former years, together with estimates and forecasts of yields and prices by States. Articles on the following subjects are also submitted: Weather Conditions during the Past Month with Relation to Crops, by C. F. Marvin; The Meat Situation, by J. M. Pickens; Need for Local Markets for Live Stock, by B. H. Rawl; Future Meat Supply of the United States, by W. J. Spillman; and The Influence of the Average Farm on the Meat Supply, by G. M. Rommel.

The future of tropical America (London, 1913, pp. IV+91, pls. 32, fig. 1).—This publication presents a brief summary of the physical, educational, and crop conditions in the various States of Central America and northern part of South America, showing their economic possibilities from an agricultural standpoint and the possible effect of the Panama Canal upon their economic development.

Victorian yearbook, 1911-12, A. M. LAUGHTON (*Victorian Yearbook*, 32 (1911-12), pp. VII+873, pls. 3).—The main object of this publication is to show the progress made by the State of Victoria during the year under review in comparison with former years and with other States and countries. In addition to more general data, it discusses the natural features, geology, and plant life in the State, and gives a detailed account of its agricultural industries, and data as to road mileage, construction, and maintenance, etc. Maps are included showing the kind and number of live stock, the production of wheat and wool, and the average rainfall in different divisions of the State during the past 5 years.

German agriculture under Emperor William II, edited by H. G. DADE (*Die deutsche Landwirtschaft unter Kaiser Wilhelm II. Leipsic*, 1913, vols. 1, pp. XI+703, pls. 2, figs. 543; 2, pp. VI+590, pl. 1, figs. 481).—These volumes present by notes, tables, and illustrations a comprehensive summary of the

progress in agriculture and the social and economic changes as affected by agricultural conditions in Germany and her colonial possessions for the last 25 years.

Agriculture and stock raising [in Norway], 1906-1910 (*Norges. Off. Statist.*, 5. ser., 1913, No. 196, pp. 75).—Besides statistics of agricultural crops and of farm animals for the years given, the report includes data as to milk production and creameries, cheese factories, and milk condensing factories in operation in the various counties and for the whole country of Norway.

Agricultural statistics, G. F. JOUBERT (*So. African Jour. Sci.*, 9 (1913), No. 12, pp. 333-342).—This article outlines the scope and discusses the economic value of agricultural statistics; points out and discusses the advantages and disadvantages of various methods of procedure and different systems employed in collecting, compiling, and tabulating the data; and make suggestions as to the best methods of securing and presenting agricultural statistics with special reference to South Africa.

Agricultural law, 1913 (*N. Y. Dept. Agr. Bul.* 51, 1913, pp. 1877-2037).—This bulletin contains the text of the statutes relating to agriculture now in force.

AGRICULTURAL EDUCATION.

Progress in agricultural education, 1912, C. H. LANE (*U. S. Dept. Agr., Office Expt. Stas. Rpt.* 1912, pp. 279-332, pls. 7, figs. 3).—This is a review for 1912 of the leading features of progress in agricultural education in this country and abroad, including the educational work of this Department, the Association of American Agricultural Colleges and Experiment Stations, the National Education Association, and of agricultural education at other conventions, and of items of interest as to the different agricultural colleges, normal schools, and secondary and elementary schools.

Statistics of land-grant colleges and agricultural experiment stations, 1912, B. B. HARE (*U. S. Dept. Agr., Office Expt. Stas. Rpt.* 1912, pp. 233-277).—A compilation from official sources of general statistics, courses of study, attendance, value of funds and equipment, revenues, and additions to equipment of the land-grant colleges and of the lines of work, revenues, and additions to equipment of the agricultural experiment stations for the fiscal year ended June 30, 1912.

Report of agriculture in the high schools of Michigan, W. H. FRENCH (*Mich. Agr. Col., Dept. Agr. Ed. Bul.* 12, 1913, pp. 26, figs. 14).—The purpose of this report on what has been accomplished is to show the growth of the subject as a part of public education and the effect of the introduction of the course upon the high school, the community, and those who study it. A statistical statement showing the number of students pursuing agricultural courses, cost of apparatus, amount of land used, etc., is appended.

Agricultural education and research in England and Wales (*Bd. Agr. and Fisheries [London], Leaflet* 197, 1913, pp. 16).—A summary is given of the provisions for agricultural education and research in England and Wales, including a short account of the work of each college, farm school, dairy school, and similar institutions, data as to the institutions selected for research and advisory work, etc.

Agricultural education in Scandinavia, J. R. AINSWORTH-DAVIS (*Jour. Bd. Agr. [London]*, 20 (1913), No. 3, pp. 212-221).—This is a detailed account of the systems of agricultural education in Sweden, Norway, and Denmark.

List of agricultural and horticultural officials, institutions, and associations (*Verslag. en Meded. Dir. Landb. Dept. Landb., Nijr. en Handel.* 1913, No.

2, pp. 127).—This list contains the organization and personnel of the Department of Agriculture, Industry, and Commerce, including the agricultural education service, agricultural education and research institutions, agricultural and horticultural winter schools, itinerant agricultural and horticultural instructors, and agricultural and horticultural associations in the Netherlands.

Window gardening for schools, F. H. CARDOZO (*Bul. Fla. Agr. and Mech. Col. for Negroes*, 6 (1913), No. 1, pp. 19).—This reference text for teachers gives directions for window flower and vegetable gardening.

The Home Gardening Association (*Ann. Rpt. Home Gard. Assoc. [Cleveland]*, 13 (1912), pp. 35, figs. 18).—This report describes briefly the work done by the association in 1912, and offers suggestions for children's gardens and information concerning the publications, history, seed distribution, etc., of the association.

Selecting and staging vegetables for exhibition (*Nature Guard [R. I. State Col.]*, Leaflet 100, 1913, pp. 29-32, fig. 1).—Suggestions to boys and girls on the selection, packing, shipping, and staging of specimens for exhibits of vegetables at fairs and exhibitions.

Woman's place in rural economy, P. DE VUYST, trans. by NORA HUNTER (*London, Glasgow, and Bombay*, 1913, pp. XI+151).—This is an English translation of the revised edition of this book, previously noted (*E. S. R.*, 18, p. 1094).

Home economics at the New York State College of Agriculture, MARTHA VAN RENSSELAER (*Cornell Reading Courses*, 2 (1913), No. 37, pp. 120-152, figs. 11).—This lesson consists of a historical sketch and description of the work in home economics at the New York State College of Agriculture, together with suggestions concerning vocations open to students in home economics.

Lessons in cooking for the sick and convalescent (*Washington: U. S. Dept. Int.*, 1913, pp. 32).—This bulletin, containing 12 theoretical and practical lessons in cooking for the sick and convalescent, has been prepared for the use of the cooking class of the nurses' training school in the Government Hospital for the Insane, Washington, D. C. These lessons, consisting of recipes followed by notes, are classified according to the composition of the foods prepared.

Suggestions for the dining room, MABEL MUSKIMEN and JOSEPHINE MATTHEWS (*Agr. Col. Ext. Bul. [Ohio State Univ.]*, 8 (1913), No. 10, pp. 16, figs. 13).—Suggestions are given concerning the planning and serving of meals, etc.

The educational museum at Clark University—catalogue of the department of school hygiene, W. H. BURNHAM and M. EVELYN FITZSIMMONS (*Reprinted from Pedag. Seminary*, 18 (1912), No. 4, pp. 526-552).—Nutrition, architecture and school sanitation, and similar subjects are included in this collection. The publication as a whole will prove of interest to those desiring to install school museums, since it gives data regarding the general classification and arrangement of material.

Farmers' institute and agricultural extension work in the United States, 1912, J. HAMILTON (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1912*, pp. 333-383).—This is the annual report of the Farmers' Institute Specialist of this Office for 1912, concerning the work of the Office in promoting farmers' institutes and the development of the farmers' institute movement in the different States and Territories. It includes, among other things, not only the progress made during the year with farmers' institutes for young people, womens' institutes, and movable and correspondence schools, but an account of the annual meeting of the American Association of Farmers' Institute Workers, extension work by the agricultural colleges, itinerant work in teachers' institutes and rural schools, agricultural extension work in foreign countries, the principal points of prog-

ress by States and Territories, and the usual statistical tables covering various lines of institute effort.

The farm adviser in Missouri, F. B. MUMFORD and D. H. DOANE (*Missouri Stat. Circ. 59, rev., pp. 189-202*).—This circular describes the plan of organization which now exists in Missouri relative to the employment of farm advisers or county agents, gives the text of an act of the legislature authorizing county courts to appropriate funds for a county farm adviser to act in cooperation with the college of agriculture, and outlines the necessary steps in organizing a county for the purpose.

The county farm adviser plan, D. H. DOANE (*Missouri Sta. Circ. 60, pp. 203-206*).—This circular gives a briefer outline of the plan noted above.

[Suggestions for extension work in rural schools], W. E. MORTON and D. S. BULLOCK (*Quart. Bul. Stephenson Training and Agr. School, 2. ser., 1913, No. 1, pp. 7*).—This bulletin presents some suggestions as to the best methods of testing seed corn, and calls attention to some of the ways in which the Stephenson Training and Agricultural School is prepared to assist farmers.

MISCELLANEOUS.

Annual Report of the Office of Experiment Stations, 1912 (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1912, pp. 333, pls. 17, figs. 3*).—This includes the usual report on the work of this Office for the fiscal year ended June 30, 1912, and of the work and expenditures of the agricultural experiment stations in the United States, including Alaska, Hawaii, Porto Rico, and Guam; statistics of the agricultural colleges and experiment stations for 1912, noted on page 897; and reviews of the progress of agricultural education and farmers' institutes and extension work, abstracted on pages 897 and 898.

Annual Report of California Station, 1913 (*California Sta. Rpt. 1913, pp. LXX, pls. 6*).—This contains the organization list, a report of the director on the work and publications of the college of agriculture and station during the year, and a list of the station publications available for distribution. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-first Annual Report of New York State Station, 1912 (*New York State Sta. Rpt. 1912, pp. VII+900, pls. 69, figs. 19*).—This contains the organization list; a financial statement as to the federal funds for the fiscal year ended June 30, 1912, and as to the state funds for the fiscal year ended September 30, 1912; reprints of Bulletins 343-356, Technical Bulletins 19-24, 25 (corrected), and 26, Circulars 18 and 19, and popular editions of Bulletins 343-347, 349, 350, 352, 353, and 355, all of which have been previously noted; a list of the periodicals received by the station; and meteorological observations noted on page 812 of this issue.

Laws applicable to the United States Department of Agriculture, compiled by O. H. GATES (*Washington: U. S. Dept. Agr., Office Solicitor, 1912, pp. 442; 1. Sup., pp. 61*).—These publications represent a revision of that previously noted (*E. S. R., 20, p. 94*), the first embracing legislation in force August 27, 1912, and the supplement that enacted from that date to March 4, 1913.

The county experiment farm law (*Ohio Sta. Circ. 139, pp. 139-142*).—This contains the text of the law authorizing the establishment of county experiment farms in Ohio as amended April 14 and 15, 1913.

NOTES.

Nevada University and Station.—A two-story brick and stone dairy building is under construction. The first floor will contain butter and ice cream manufacturing laboratories, a cheese curing room, a refrigeration plant, and a demonstration room for separators, etc. The second floor will be devoted to lecture and office rooms.

Charles S. Knight, formerly assistant professor, has returned as professor of agronomy and agronomist of the station. Frank L. Peterson, instructor in irrigation and farm mechanics and irrigation engineer, has been appointed assistant professor of farm mechanics at the University of California beginning January 1, 1914. Dr. A. A. Heller, assistant professor of botany, horticulture, and forestry, has resigned.

North Carolina College.—E. T. Stoddart has been appointed instructor in horticulture.

Oklahoma College.—According to *The New Education*, the State Board of Agriculture has established a department of marketing in the college with an initial allotment of \$5,000 for its use. An important feature of this new work is expected to be the grading free of cost of cotton samples.

Josiah Main, instructor in agriculture at the Western Kansas State Normal School, has been appointed professor of agriculture for schools.

Oregon College.—It is expected that the domestic science wing of the home economics building will be ready for occupancy February 1. This section of the building will contain 3 laboratories with accommodations for 40 students each, and 5 laboratories accommodating 20 students each. There will also be a laboratory for experimental work and a basement cafeteria with a capacity of 200. For the present a portion of the building will be occupied by the department of domestic art, which will eventually be quartered in the wing now under construction.

A new barn 122 by 52 feet has been added to the farm buildings group. The lower floor will be used for housing beef cattle and fat sheep kept for stock judging purposes.

Sanitary methods of handling milk were demonstrated by the dairy and bacteriological departments in the pure milk show held in Portland and at the State Fair. The experts in charge tested samples of milk for visitors as desired.

Porto Rico College.—An apprentice course in general agriculture is being offered in which the students work eight hours per day at manual labor on the farm with from one to two hours special class instruction.

D. T. Griswold, professor of animal husbandry, has resigned and was succeeded January 1 by E. G. Ritzman of the Federal Station.

Utah Station.—A. B. Ballantyne, superintendent of the St. George substation, has resigned to take up work in orchard surveying with the State Horticultural Commission. E. G. Carter has resigned as assistant bacteriologist to engage in commercial work and has been succeeded by Leslie E. Smith of the class of 1913.

Virginia Station.—Bruce Williams has been appointed assistant bacteriologist and has entered upon his duties.

ADDITIONAL COPIES of this publication
may be procured from the SUPERINTEND-
ENT OF DOCUMENTS, Government Printing
Office, Washington, D. C., at 15 cents per copy

Subscription price, per volume of 9 numbers, \$1



INDEX OF NAMES.

- Abbe, C., 121.
 Abbey, C. D., 440.
 Abbey, M. J., 600.
 Abbot, C. G., 720, 721.
 Abbott, J. B., 434.
 Abbott, J. S., 61.
 Abderhalden, E., 64, 408, 881.
 Abé, G., 565.
 Abel, M. H., 459.
 Achard, C., 174.
 Ackerman, E. B., 499.
 Ackermann, E., 806.
 Ackert, J. E., 699.
 Acqua, C., 323.
 Adams, A. B., 798.
 Adams, C. R., 683.
 Adams, F., 588.
 Adams, G. O., 315.
 Adams, H. S., 239, 341.
 Adams, J., 828.
 Adamson, J. E., 121.
 Adlung, 59, 361.
 Agar, M., 42.
 Agcaoli, F., 118.
 Agee, A., 193, 498.
 Agee, H. P., 97.
 Ageon, C. N., 520, 609.
 Agrostis, 475.
 Agulhon, H., 716.
 Ainsworth-Davis, J. R., 546, 575, 897.
 Aitken, T., 687.
 Åkerberg, H., 488.
 Albrecht, C., 162.
 Alciatore, H. F., 510.
 Alderman, L. R., 400.
 Alderman, W. H., 40, 745.
 Aldrich, J. M., 794.
 Alford, S. W., 795.
 Algarra y Postius, J., 162.
 Algué, J., 813.
 Allen, 471.
 Allen, F. L., 196.
 Allen, I. C., 892.
 Allen, R. H., 777.
 Allen, R. T., 16.
 Allen, R. W., 540.
 Allen, W. J., 838.
 Allen, W. M., 266.
 Allen-Brown, A., 149.
 Allen-Brown, D., 149.
 Allison, A., 363.
 Allison, H. O., 667.
 Alpers, K., 376.
 Alsberg, C. L., 7, 800.
 Alter, J. C., 314, 414, 510.
 Alternath, J., 341.
 Althausen, L., 534, 634.
 Alvarez, A. C., 442.
 Alvarez, R., 198.
 Alvisi, U., 823.
 Alway, F. J., 397, 724.
 Amatsu, H., 881.
 Ames, A., 451.
 Ames, C. T., 35, 736.
 Ames, J. W., 32.
 Amos, P. A., 263.
 Amstel, J. E. van, 714.
 Amundsen, E. O., 159, 248.
 Ancelin, R., 326.
 Anderson, A. O., 685.
 Anderson, F. I., 293.
 Anderson, J. A., 398.
 Anderson, J. F., 560.
 Anderson, P. J., 753.
 Anderson, W. A., 241, 747.
 Anderson, W. S., 794.
 Andouard, P., 65.
 André, G., 218.
 Andrews, E. L., 197.
 Andrews, F. M., 828.
 Andrews, L. W., 798.
 Andrews, V. L., 270.
 Andrews, W. H., 476.
 Andriik, K., 536, 832, 833.
 Andros, S. O., 121.
 Angelico, F., 132.
 Angelis d'Ossat, G. de, 19.
 Angerer, C. von, 882.
 Angier, H. W., 121, 415.
 Anglada, J. A., 787.
 Angot, A., 120.
 Annett, H. E., 149.
 Annett, H. G., 377.
 Anstead, R. D., 748.
 Anstruther, A. W., 273.
 Anthony, R. D., 196.
 Appel, O., 548.
 Appleman, C. O., 230.
 Aragão, H. de B., 588.
 Arbos, 190.
 Archibald, R. A., 500.
 Archibald, R. G., 582.
 Archichovsky, V. M., 433, 529.
 Arens, P., 843.
 Armand-Delille, P., 677.
 Armstrong, E. F., 219, 321, 421.
 Armstrong, H. E., 321.
 Armstrong, S. F., 143.
 Arnim, O. von, 286.
 Arnold, J. H., 534, 590.
 Arnold, J. L., 892.
 Arnold, W., 278.
 Arnoldi, B. M., 624.
 Army, A. C., 93.
 Army, L. W., 700.
 Arthur, J. C., 433, 750.
 Ascoli, V., 659.
 Ashby, R. C., 870.
 Ashby, S. F., 345, 350.
 Ashenberger, A., 510.
 Ashmead, W. H., 250.
 Ashton, J., 171, 273.
 Askinazi, V. O., 509.
 Assmann, W., 583.
 Aston, B. C., 728, 729, 730.
 Astruc, A., 28, 628.
 Astruc, H., 554.
 Atkins, W. R. G., 828.
 Atkinson, A., 97, 600.
 Atkinson, G. F., 424.
 Atkinson, T. R., 182.
 Atwood, G. G., 746.
 Atwood, W. M., 135, 538.
 Aubert, A. B., 107.
 Aubone, D., 198.
 Aubrey, V. G., 397.
 Audebeau, 816.
 Auerbach, F., 268.
 Augstin, 181.
 Augustin, M., 479.
 Auhagen, 570.
 Aulard, A., 161.
 Auld, S. J. M., 113, 170.
 Aulmann, G., 653.
 Aune, B., 31.
 Avé-Lallemant, E., 863.
 Averitt, S. D., 797.
 Aversa-Saccá, R., 243, 250.
 Aviragnet, E. C., 662.
 Ayers, S. H., 73, 718.
 Babcock, D. C., 196.
 Babcock, E. B., 96.
 Babcock, S. M., 399.
 Babes, V., 679.
 Babkin, B. P., 465.
 Bach, H., 625.
 Bachelier, 367.
 Bachmann, F. M., 449.
 Back, E. A., 348.
 Backhaus, A., 199.
 Baco, F., 148.
 Baer, J., 63.
 Baer, M. K., 292.
 Baerthlein, 882.
 Baeslack, F. W., 681.
 Bagnall, R. S., 251.
 Bahnsen, P. F., 384.
 Bahr, F., 622.
 Bailey, C. H., 262, 864.
 Bailey, E. M., 800.
 Bailey, F. D., 150.
 Bailey, H. H., 554.

- Bailey, I. W., 217.
 Bailey, L. H., 196, 199, 395.
 Bailey, V., 755.
 Bailly, M., 850.
 Bailly, O., 411.
 Bainer, H. M., 689.
 Bainier, G., 345, 547.
 Baker, A. C., 54.
 Baker, C. F., 158.
 Baker, H. D., 891.
 Baker, J. L., 342.
 Baker, S. M., 827.
 Bakke, A. L., 750.
 Baldwin, E. H., 386.
 Baldwin, R. J., 800.
 Balfour, A., 582.
 Ball, C. R., 141, 738.
 Ballantyne, A. B., 900.
 Ballou, H. A., 756.
 Balls, W. L., 27.
 Balmer, F. E., 795.
 Bamber, M. K., 215.
 Bancroft, K. A., 451, 552.
 Bang, O., 479.
 Bangs, (Mrs.) B., 868.
 Baranov, A. D., 852.
 Barber, T. C., 563.
 Barcia y Trelles, J., 491.
 Bark, D. H., 180.
 Barker, B. T. P., 208.
 Barker, F. D., 484.
 Barker, H. S., 397.
 Barnard, H. E., 16.
 Barnes, H., 588.
 Barnes, W. C., 666.
 Barnett, A. G., 893.
 Barnett, N. M., 600.
 Barnett, R. L., 397.
 Barr, G. H., 777.
 Barre, de la, 671.
 Barrett, E., 815.
 Barrett, J. T., 396.
 Barrett, O. W., 340, 461, 839.
 Barrowcliff, M., 727.
 Barrus, M. F., 549.
 Bars, H. P., 150, 154.
 Barthel, C., 206, 279.
 Bartholomew, E. T., 220.
 Bartlett, J., 830.
 Bartlett, J. M., 799.
 Bartow, E., 617.
 Bartz, W., 377.
 Barus, C., 329.
 Basile, C., 385.
 Bass, 460.
 Bass, C. C., 865.
 Bassalik, K., 316.
 Batchelor, L. D., 147, 148, 541.
 Bateman, H., 314.
 Bates, C. G., 43.
 Bates, F. W., 124.
 Bates, O., 291.
 Bates, P. H., 686.
 Bateson, E., 51.
 Bateson, W., 769.
 Battie, J. S., 342.
 Bauche, J., 783.
 Baudyš, E., 346.
 Bauer, H., 506.
 Bauer, O., 125.
 Baughman, D. E., 482.
 Baume, W. la, 653.
 Bavin, T. R., 862.
 Bayley, S. H., 644.
 Beach, C. L., 769, 777.
 Beach, D., 195.
 Beal, A. C., 398.
 Beal, F. E. L., 452.
 Beal, J. M., 300.
 Beal, W. H., 792.
 Beals, E. A., 120.
 Bear, F. E., 197.
 Beattie, J. M., 677.
 Beattie, W. R., 894.
 Beaufreton, M., 494.
 Bechtel, J. R., 398.
 Becker, H., 117.
 Deckurts, H., 506.
 Beckwith, T. D., 820.
 Bedford, G. A. H., 476.
 Beegle, F. M., 807, 861.
 Béhal, 661.
 Behre, A., 361.
 Beinhart, E. G., 536.
 Belitzer, A. W., 479.
 Bell, A. G., 171.
 Bell, C. E., 266.
 Bell, J. A., 292.
 Bell, J. M., 203.
 Bell, T. O., 737.
 Belling, J., 228.
 Belmont, A., 471.
 Belz, J. O., 721.
 Bemelmans, E., 883.
 Benecke, W., 422.
 Benedict, F. G., 270.
 Bennett, A. A., 698.
 Bennett, F., 16.
 Bennett, H. H., 16.
 Bennett, W. J., 510.
 Benson, H. K., 149, 486.
 Benson, M., 674.
 Benson, O. H., 193.
 Benson, T. A., 70.
 Bentley, F. L., 497, 699.
 Bentley, G. M., 53, 236, 458, 459, 653.
 Benton, A. H., 794.
 Benton, J., 683.
 Benze, E., 514.
 Bequaert, J., 563.
 Beresford, R., 894.
 Berg, E. J., 88.
 Berg, R., 366, 809.
 Berg, W. N., 268.
 Bergeim, O., 267.
 Bergonié, J., 174.
 Berkhout, A. D., 127.
 Berlese, A., 854.
 Berliner, E., 658.
 Berliner, M., 180.
 Bernard, P. N., 783.
 Bernardi, A., 613, 716.
 Bernardini, L. B., 525.
 Bernstein, E. P., 676.
 Bernthsen, H. A., 127.
 Berrar, M., 477.
 Berry, A. H., 159.
 Berry, R. A., 170.
 Bersch, W., 331.
 Bertarelli, E., 57.
 Berthault, 629.
 Berthault, F., 731.
 Berthault, P., 731.
 Bertoni, M. S., 340, 351.
 Bertrand, A., 126.
 Bertrand, G., 129, 219, 506.
 Besana, C., 777.
 Besley, F. W., 441.
 Besley, M., 362.
 Besse, R. S., 699.
 Betts, G. H., 494.
 Betts, H. S., 544.
 Beveridge, W. W. O., 856.
 Bexell, J. A., 792.
 Bezzi, M., 760.
 Bianchi, C., 628.
 Bianchi, D. C., 175.
 Bibby, I. J., 398.
 Bidart, R., 178.
 Biddle, H. C., 664.
 Bierbaum, K., 205.
 Biermann, 50.
 Biffen, R. H., 845.
 Bigelow, A. P., 775, 777.
 Billings, H. E., 317.
 Biltz, W., 609.
 Bioletti, F. T., 96.
 Bircher, E., 174.
 Birckner, V., 629.
 Bird, H., 457.
 Birt, A. G., 816.
 Bishop, E. C., 400.
 Bishop, E. S., 795.
 Bishop, J. L., 879.
 Bishopp, F. C., 58, 256, 359, 454, 559, 861.
 Bizzell, J. A., 22, 212, 317, 818.
 Black, O. F., 7.
 Blackburn, R. E., 697.
 Blackledge, L. M., 28.
 Blackmar, F. W., 867.
 Blair, A. W., 498, 797.
 Blair, W. R., 120, 721.
 Blair, W. Reid, 500.
 Blaizot, L., 479.
 Blake, M. A., 498.
 Blakeslee, A. F., 216.
 Blanc, G. R., 855.
 Blanchard, A. H., 291.
 Blanck, E., 215, 316, 514.
 Blasingame, R. U., 398.
 Blatchley, W. S., 144.
 Bliss, G. S., 120.
 Bloch, M., 662.
 Block, A., 322.
 Blodgett, F. M., 196, 346.
 Bloor, W. R., 269, 768.
 Blumenfeldt, E., 166.
 Blunt, A. W., 643.
 Boch, J., 113.
 Boeke, H. E., 319.
 Böhi, A., 312.
 Böhmer, G., 336.

- Böing, 760.
 Bokorny, T., 30, 421.
 Boland, E. N., 195, 397.
 Bolin, P., 427.
 Bolle, 2.
 Bolle, J., 119.
 Bolley, H. L., 515, 516, 634.
 Bolton, B. M., 384.
 Boltz, G. E., 32.
 Boname, P., 336.
 Bond, F. M., 344.
 Bondar, G., 655.
 Bondartsev, A., 752.
 Bonebright, H. B., 688.
 Donnell, H. H., 267.
 Bonnett, W. E., 121, 510, 721, 812.
 Bono, A., 411.
 Bonsteel, J. A., 416.
 Bonthuis, R. F., 235.
 Bookman, S., 63.
 Boorsma, W. G., 566.
 Boquet, A., 482, 680.
 Bordas, 564, 806, 807.
 Borden, S., 573.
 Borges, J. F., 643.
 Borissjak, A. N., 481.
 Borlase, W., 144.
 Bormann, W. R., 812.
 Börnstein, R., 107.
 Borowikow, G. A., 26, 420.
 Borthwick, A. W., 554.
 Boruttau, H., 263.
 Bosman, G. J., 689.
 Bosmans, L., 714.
 Boston, L. B., 298.
 Bosworth, A. W., 9, 795, 805.
 Bottoms, T. C., 497.
 Bouchard, C., 174.
 Boucher, 68.
 Bouet, G., 482.
 Boughner, L. J., 95.
 Bouquet, A. G., 145.
 Bourcart, E., 341.
 Bourne, J., jr., 890.
 Bourne, R., 443.
 Bourquelot, E., 505, 509.
 Bouvier, 58.
 Bouyoucos, G. J., 16, 300, 618.
 Bowie, W. T., 130, 131.
 Bowman, A. E., 399.
 Bowman, H. J., 291.
 Boyce, W. G. H., 344, 843.
 Boyer, J., 651.
 Boyle, J. G., 395, 434.
 Brackett, E. E., 795.
 Brackett, R. N., 731.
 Bradford, F. C., 148.
 Bradlee, T., 700.
 Bradley, J. C., 359.
 Brain, C. K., 159, 457.
 Brand, C. J., 140, 397, 430.
 Brand, R. E., 771.
 Brandl, J., 368.
 Brandon, W. C., 185.
 Brandt-Wyt, R., 266.
 Branigan, E. J., 657.
 Brannon, M. A., 133.
 Braun, von, 69.
 Braun, F. E. von, 292.
 Braun, H., 176.
 Bray, C. I., 876.
 Breazeale, J. F., 322.
 Bredemann, G., 316, 869.
 Bredenberg, G. A., 806.
 Brenchley, W. E., 30, 523.
 Brennemann, J., 360.
 Brétignière, L., 731.
 Bretschneider, A., 650.
 Brett, L., 182.
 Brettell, C., 489.
 Brew, J. D., 473.
 Brewster, J. F., 477.
 Bricker, G. A., 267.
 Bricout, G., 285.
 Bridel, M., 505.
 Bridré, J., 680.
 Brierly, W. G., 794.
 Briggs, C. H., 564.
 Briggs, L. J., 87, 721, 825.
 Briggs, R. G., 700.
 Brigham, A. A., 700.
 Brinkley, L. L., 16.
 Brinkmann, H., 881.
 Brinkmann, T., 391.
 Brion, G., 417.
 Briosi, G., 351.
 Briscoe, C. F., 77, 78.
 Brittain, J. I., 573.
 Britton, J. C., 16, 17.
 Britton, W. E., 655.
 Brogdon, J. S., 517.
 Broili, J., 141.
 Brooks, A. H., 210.
 Brooks, E. C., 738.
 Brooks, F. T., 847.
 Brooks, T. J., 1.
 Broounoff, P., 314, 510.
 Brouet, G., 125, 126.
 Broughton, L. B., 128.
 Brown, P. I., 314, 510.
 Brown, A. A., 149.
 Brown, B. S., 397.
 Brown, D. A., 149.
 Brown, E., 574.
 Brown, E. P., 633.
 Brown, F. R., 147, 148.
 Brown, H. B., 320.
 Brown, H. P., 44.
 Brown, J. A., 309.
 Brown, L. P., 128, 517.
 Brown, P. E., 515, 824.
 Browning, P. E., 317.
 Brownlee, G., 674.
 Brownlie, T. A. M., 485.
 Bruce, W., 169, 272.
 Bruchholz, R. G., 170, 673.
 Bruck, W. F., 546.
 Brues, C. T., 358.
 Bruhn, A. T., 475.
 Brunehant, 142.
 Brunet, A. D., 377.
 Brunetti, E., 57.
 Bruschetini, 480.
 Brush, W. D., 543.
 Bryan, A. H., 208.
 Bryan, H., 115.
 Bryant, H. C., 51, 52.
 Bryant, L. S., 162.
 Bryce, A., 163.
 Buchanan, E. D., 298.
 Buchanan, R. E., 298.
 Bucher, F. S., 16.
 Buchholz, Y., 141.
 Buchwald, J., 658.
 Buckley, R. B., 289.
 Buckman, H. O., 816.
 Buglia, G., 665.
 Bull, C. P., 794, 830.
 Bullamore, G. W., 761.
 Bullock, D. S., 899.
 Bunmeyer, B., 721.
 Bunzel, H. H., 48, 550.
 Burckhardt, J. L., 285.
 Burd, J. S., 96.
 Burdick, R. T., 785.
 Burg, A., 197.
 Burger, O. F., 242, 396, 846.
 Burgess, A. F., 255.
 Burgess, J. L., 335.
 Burke, E., 616.
 Burke, R. T. A., 16.
 Burley, R. J., 84.
 Burls, G. A., 184.
 Furmeister, H., 411.
 Burn, (Mrs.) A. M., 364.
 Burnett, E. A., 634.
 Burnham, W. H., 898.
 Burow, W., 478.
 Burr, W. W., 225, 634.
 Burri, R., 173.
 Burson, W. M., 888.
 Burt, B. C., 138.
 Burton, H. K., 721.
 Burt-Davy, J., 460, 461, 476, 738.
 Busch, S. S., 193.
 Busck, A., 758.
 Bussard, (Mrs.) O., 92.
 Busse, 44, 343.
 Bussmann, E., 518.
 Bustillo, R., 199.
 Butler, E. J., 445.
 Butler, O., 219, 748.
 Butterfield, K. L., 294.
 Butterfield, W. J. A., 821.
 Buttrick, P. L., 53.
 Byers, W. C., 16.
 Cabot, S., 111.
 Cadiot, P. J., 174.
 Cadoret, A., 551.
 Cady, Le R., 598.
 Cain, J. C., 501.
 Calderón, B., 665.
 Caldwell, J. C., 397.
 Caldwell, J. S., 523.
 Call, L. E., 598, 836.
 Calmette, A., 382, 583.
 Camden, 469, 572.
 Camden, J. M., 397.
 Cameron, A. D., 16.
 Cameron, F. K., 125, 419, 517, 821.
 Campbell, C., 188.
 Campbell, H. C., 717.
 Campbell, J. S., 444.

- Campbell, M., 399.
 Campbell, P. A., 397.
 Campbell, R. E., 96.
 Canavari, I., 212.
 Canina, E. G., 839.
 Cannon, W. A., 136, 422, 626.
 Cappelli (Marquis), 2.
 Capus, J., 849.
 Cardiff, I. D., 99.
 Cardin, P., 653.
 Cardozo, F. H., 898.
 Caring, E. G., 661.
 Carlson, W. W., 893.
 Carlyle, A., 794.
 Carlyle, W. L., 870.
 Carmichael, R. D., 406.
 Carpenter, C. A., 489.
 Carpenter, C. W., 157.
 Carpenter, G. H., 251, 555.
 Carpenter, H. B., 697, 795.
 Carr, M. E., 16.
 Carré, A., 695.
 Carré, H., 179.
 Carrier, L., 533.
 Carter, E. G., 900.
 Carter, R. H., 113.
 Carter, W. T., jr., 16.
 Cartwright, H. H., 387.
 Carver, T. N., 594.
 Cary, C. A., 197, 585.
 Casares, J., 808.
 Case, B. J., 439.
 Casson, H. N., 388.
 Castell-Evans, J., 201.
 Castelli, J. B., 50.
 Castle, W. E., 68.
 Catalano, G., 132.
 Cathcart, C. S., 665, 797.
 Cathcart, E. P., 164.
 Catlin, C. N., 415, 439.
 Catoni, G., 562.
 Cauthen, E. F., 831.
 Cavel, L., 414.
 Cayley, D. M., 245.
 Ceconi, G., 558.
 Cecil, A., 573.
 Center, O. D., 229.
 Ceradini, A., 765.
 Cesa-Bianchi, D., 175.
 Césari, E., 281, 478.
 Chaffee, N. K., 197.
 Chalmers, H., 291.
 Champlin, M., 37.
 Chancrin, E., 215.
 Chandler, W. H., 699, 745.
 Channer, F. F. R., 240.
 Chapman, B. L., 251.
 Chappaz, G., 551, 554.
 Chappel, G. M., 812.
 Chapplear, G. W., jr., 611.
 Chappellier, A., 167.
 Charbonnier, 892.
 Charmoy, D. d'E. de, 858.
 Chase, L. W., 186, 390, 593.
 Chase, W. W., 353.
 Chatterton, A. E., 891.
 Chatton, E., 759.
 Chaussé, P., 178.
 Chauzit, J., 850.
 Chavanne, J. J., 751.
 Checkley, J. H., 698.
 Chernyi, A. P., 509.
 Chevalier, A., 347.
 Chevalier, O., 233.
 Chick, H., 108, 501, 502.
 Chidester, F. E., 498.
 Childs, N. T., 795.
 Chirikov, F. V., 624, 625, 817.
 Chittenden, F. H., 453, 455, 854, 855.
 Chittenden, R. H., 763.
 Chouchak, D., 628, 732.
 Choukévitch, J., 466.
 Chrestian, J., 249.
 Chrétien, A., 206, 579.
 Chrisman, W. G., 383.
 Christensen, A., 186.
 Christensen, H. R., 519.
 Christensen, P., 24, 809.
 Christie, G. I., 299, 534.
 Chuard, E., 503.
 Church, J. E., jr., 814.
 Churchill, O. O., 830.
 Churchman, J. W., 882.
 Claassen, C. H., 145.
 Claassen, O., 412.
 Clark, E., 180.
 Clark, E. McC., 396.
 Clark, G. H., 769.
 Clark, H. W., 230, 315.
 Clark, J. A., 222, 233, 271, 536.
 Clark, K. M., 342.
 Clark, R. W., 397.
 Clark, W. M., 107.
 Clarke, L. D., 96.
 Clarke, W. T., 32, 96.
 Clausen, 821.
 Clausen, H., 151.
 Clawson, A. B., 280.
 Claxton, P. P., 162, 400.
 Clayton, H. D., 799.
 Cleare, L. D., jr., 655.
 Clegborne, W. S. H., 489.
 Cleland, J. B., 756.
 Clément, H., 554.
 Clerk, D., 184.
 Clifton, E., 138.
 Cline, I. M., 510, 812.
 Clinton, G. P., 351, 547, 552.
 Clothier, R. W., 725, 735.
 Clute, W. N., 193.
 Clutterbuck, P. H., 444.
 Coates, T. J., 397.
 Coberly, E. D., 812.
 Coburn, F. D., 121, 181.
 Cochel, W. A., 773.
 Cockerell, T. D. A., 255.
 Codd, A. A., 266.
 Coe, H. S., 700.
 Coffey, G. N., 17.
 Coggeshall, G. W., 518.
 Coggins, H. C., 785.
 Cohnheim, O., 662.
 Coit, J. E., 542.
 Cole, H. S., 510.
 Coleman, G. A., 96.
 Colin, H., 202.
 Colland, J. W., 196.
 Collens, A. E., 644.
 Collin, E., 660.
 Collings, J., 895.
 Collins, G. N., 34, 35, 229, 633.
 Collison, R. C., 799.
 Collison, S. E., 211, 237, 641.
 Colton, G. R., 889.
 Colver, C. W., 236.
 Colyer, F. H., 510.
 Combes, R., 526.
 Compain, H., 632.
 Compere, G., 158.
 Compton, A., 506.
 Compton, R. H., 136.
 Comstock, (Mrs.) A. B., 196.
 Comstock, L., 93.
 Condit, I. J., 96.
 Congdon, L. A., 659.
 Conn, H. J., 222.
 Connell, A. B., 342.
 Connell, W. H., 182.
 Conolly, H. M., 195.
 Conrad, L. E., 86.
 Conseil, E., 479.
 Conte, le, 869.
 Cook, F. C., 800.
 Cook, M. T., 549, 847.
 Cook, O. F., 37, 47, 67, 140, 341, 458, 534, 634.
 Cooke, (Mrs.) A. B., 465.
 Cooke, W. W., 352.
 Cooley, F. S., 692.
 Cooley, J. S., 647, 648.
 Cooley, M. S., 593.
 Cooley, R. A., 652.
 Cooley, R. B., 399.
 Coons, G. H., 155.
 Cooper, A. T., 315.
 Cooper, E. A., 463, 568.
 Cooper, J. R., 348, 497.
 Cooper, M., 436.
 Cooper, T. P., 700.
 Cooper, W. F., 579, 656, 680.
 Coover, W. C., 698.
 Copeland, J., 643.
 Copeland, W. F., 93.
 Corbett, L. C., 103, 492.
 Corbett, L. S., 397, 779.
 Cordley, A. B., 300.
 Corper, H. J., 177, 309.
 Corsa, W. S., 271.
 Cory, E. N., 353.
 Cosens, A., 353.
 Cotrim, E., 870.
 Cotton, E. C., 658.
 Cotton, F. A., 597.
 Cotton, W. E., 500, 778.
 Coulter, J. L., 789.
 Coulter, J. M., 97.
 Coupan, G., 86, 593.
 Coupland, C., 634.
 Courmont, P., 174.
 Couvy, L., 563.
 Coville, F. V., 148.

- Cowell, C. F., 203.
 Cox, H. R., 538, 541.
 Cox, N. H., 387.
 Cox, W. T., 239.
 Crabb, G. A., 16.
 Crabill, C. H., 645, 648.
 Cragg, F. W., 760.
 Craig, H. A., 368.
 Craig, T., 285.
 Cramer, W., 868.
 Cramp, H., 362.
 Crandall, C. S., 41, 326.
 Crawford, D. L., 759.
 Crawford, J. C., 562.
 Crawley, J. T., 12, 37, 85.
 Creel, R. H., 158, 651, 852.
 Cresswell, M. E., 697.
 Crider, F. J., 899.
 Crissler, O. S., 794.
 Crocheron, B. H., 96.
 Crochetelle, J., 65.
 Crocker, W., 131, 132, 529.
 Crocker, W. J., 889.
 Croesen, 105.
 Crohn, B. B., 268.
 Cronheim, W., 664.
 Crosby, C. R., 98, 458.
 Crosby, D. J., 494.
 Crosby, L. S., 399.
 Crosby, W. W., 291.
 Cross, C. F., 65, 201.
 Cross, F. J., 567.
 Cross, W. E., 800.
 Crowther, C., 170, 278, 422.
 Cruess, W. V., 96.
 Crump, W. B., 626.
 Csonka, F. v., 309.
 Cuboni, 2.
 Cuif, E., 444.
 Cullen, H., 757.
 Cunningham, A., 279.
 Curry, B. E., 769, 797.
 Curtis, H. E., 823.
 Curtis, R. S., 69, 76.
 Curtis, R. W., 196, 699.
 Curtius, T., 303.
 Cushman, A. S., 518, 865.
 Cutler, W. P., 362.
 Cutting (Mrs.) L. M., 362.
 Czadek, O. v., 311.
 Dabney, C. W., 91.
 Dacy, A. L., 744, 745.
 Dade, 666.
 Dade, H. G., 896.
 Dafert, F. W., 119, 214.
 Daille, A., 83.
 Daire, 474.
 Dalby, D. S., 634.
 Dale, T. F., 874.
 Dall, M., 186.
 Dallimore, W., 842.
 Dalrymple, W. H., 469.
 Dam, W. van, 504, 580.
 Dame, G. M., 463, 467.
 Dammann, H., 631, 738.
 Daniel, L., 434, 838.
 Daniel-Brunet, A., 377.
 Daniels, A. L., 465.
 Daniels, A. M., 292.
 Daniels, H. O., 473.
 Dantony, E., 451.
 Dantony, F., 850.
 Danulesco, V., 588.
 Dare, H. H., 785.
 Darling, S. T., 483, 682.
 Darnell-Smith, G. P., 46, 170.
 Darner, R. W., 811.
 Dasse, F., 15.
 Dassonville, C., 281.
 Dastur, J. F., 548.
 Daugherty, C. M., 296.
 Daugherty, R. L., 893.
 Davenport, C. B., 466.
 Davenport, E., 97, 604, 698.
 Davenport, L., 766.
 Davidson, J., 58, 854.
 Davidson, J. B., 105, 484.
 Davies, J. R., 415.
 Davies, L., 266.
 Davis, B. M., 135.
 Davis, C. H., 91.
 Davis, E. C., 794.
 Davis, J. J., 359, 561.
 Davis, J. R. A., 546, 575, 897.
 Davis, L. H., 58.
 Davis, L. M., 71.
 Davis, M., 64, 664.
 Davis, N. S., 163.
 Davis, R. O. E., 314.
 Davis, W. A., 609.
 Davy, J. B., 460, 461, 476.
 Day, G. E., 872.
 Day, P. C., 496, 812.
 Dayton, W. A., 543.
 Dean, A. D., 791.
 Dean, A. L., 111.
 Dean, G. A., 253, 653.
 Dean, S., 290.
 Dean, W. H., 860.
 De Angelis d'Ossat, G., 19.
 Deardorff, C. E., 699.
 Dearing, C., 238.
 Dearing, W. G., 830.
 DeBussy, 853.
 Dechambre, P., 771.
 De Charmoy, D. d'E., 858.
 Deddard, F. E., 250.
 Deerr, N., 413.
 De Fontgalland, A., 89.
 De Graff, E. T., 574.
 De Hennet, 103.
 De Jaczewski, 2.
 De Jong, A. W. K., 448, 829, 843.
 De Jong, D. A., 84.
 Dejonghe, G., 312.
 De Kegel, M., 444.
 De la Barre, 671.
 De Lapparent, H., 368.
 Delaunay, H., 767, 768.
 Delbrück, M., 509.
 Deleano, N. T., 324.
 Delille, P. A., 677.
 Delmotte, R., 338.
 Delos, A., 104.
 Delphon, J., 838.
 De Man, J. G., 360.
 Demaree, J. B., 399.
 De Miklós, E., 2, 105.
 D'Emmerez de Charmoy, D., 858.
 De Molins, J. E., 595.
 Demolon, A., 25, 26, 125, 126, 127.
 Demoussy, E., 27.
 Denarnaud, P., 482.
 Deneumostier, C., 535.
 Denis, W., 465.
 Densch, A., 823.
 De Oro, J., 198.
 De Pozzi, 2.
 De Ruijter de Wildt, J. C., 127.
 De Saporta, A., 414.
 Desliens, L., 886.
 Despeissis, A., 228.
 Desriot, A., 215.
 DesRoches, A., 360.
 De Szomjas, L., 105.
 Detlefsen, J. A., 769.
 Dettingen, von, 171.
 Dettweiler, 68.
 Dettweiler, D., 215.
 De Verteuil, J., 746.
 De Vilmorin, M., 104, 217.
 De Vogüé, L., 105.
 De Vuyst, P., 2, 101, 898.
 Dew, J. A., 655.
 Dewey, L. H., 312.
 De Wildt, J. C. de R., 127.
 Dexter, E. K., 415, 722, 812.
 Diacon, H. F., 157.
 Dibble, W., 768.
 Diedrichs, A., 612.
 Dieterlen, 582.
 Dietrich, W., 772, 795.
 Dillon, J. J., 894.
 Dimon, J. F., 595.
 Dinsmore, S. C., 266.
 Dinwoodie, J. T. E., 794.
 D'Ippolito, G., 538, 740.
 Disselhorst, R., 570.
 Dix, J. H., 95.
 Dix, W., 550.
 Dixon, H. H., 828.
 Doane, D. H., 899.
 Doane, R. W., 652.
 Dobbs, H., 44.
 Dodd, E. L., 120.
 Dodd, S., 478.
 Dodge, H. E., 497.
 Dodge, L. G., 391.
 Dodge, H. A., 740.
 Dodt, J., 308.
 Doerr, R., 477.
 Dollfus, A., 250.
 Donaldson, R., 677.
 Donisthorpe, H. St. J., 358.
 Donovan, R. L., 794.
 Dop, L., 2.
 Dorlencourt, H., 662.
 Dorner, H. B., 840.
 Dorph-Petersen, K., 433.
 Dos Passos, J. R., 90.
 D'Ossat, G. de A., 19.
 Doten, S. B., 158.
 Dougherty, J. E., 574.

- Douglass, A. E., 14.
 Downing, G. E., 697.
 Downs, C. R., 111.
 Dowson, W. J., 647.
 Dox, A. W., 712.
 Drake, J. A., 140.
 Dray, W. R., 184.
 Drennan, R., 571.
 Drew, J. M., 390.
 Droge, W. F., 879.
 D'Rohan, W., 386.
 Drost, A. W., 350.
 Drost, J., 612.
 Drysdale, J., 473.
 Dschunkowsky, E., 582.
 Dubard, M., 421.
 Ducellier, L., 149.
 Duffus, W. M., 90, 691.
 Duggar, B. M., 132.
 Duggar, J. F., 335, 336, 831.
 Duggar, J. F., jr., 396.
 Dukes, C., 363.
 Dumas, J., 895.
 Dumont, F. T. F., 370.
 Dumont, J., 337, 431.
 Dumont, R., 329, 837, 890.
 Duncan, C. H., 175.
 Duncan, G. W., 598.
 Duncan, L. N., 598.
 Dungere, E. von, 167.
 Duniway, C. A., 400.
 Dunlap, F., 135, 699.
 Dunlap (Mrs.) H. M., 362.
 Dunlap, J. H., 815.
 Dunlop, W. R., 347.
 Dunn, J. E., 17.
 Dunn, R., 698.
 Dunne, J. J., 278, 577, 578.
 Dunnewald, T. J., 17.
 Dunnicliff, A. A., jr., 672.
 Dunstan, W., 318.
 Dupont, P. R., 839.
 Du Pont, T. C., 291.
 Duport, L., 46.
 Du Puy, W. A., 329.
 Durand, E. D., 196.
 Durand, E. M., 827.
 Durand, W. L., 891.
 Durham, C. B., 698.
 Durrant, J. H., 856.
 Duryee, W. B., jr., 535.
 Du Sablon, L., 524.
 Dutt, H. L., 759.
 Duval, M., 174.
 Dyar, H. G., 357, 456.
 East, E. M., 31, 216, 333, 536.
 Easterby, H. T., 739.
 Eastick, J. J., 613.
 Eastman, J. F., 533.
 Echegaray, R., 198.
 Echols, W. H., 181.
 Eck, J. J. van, 310.
 Eckart, C. F., 97.
 Eckerson, S., 134, 527.
 Eckert, A., 811.
 Eckles, C. H., 673.
 Eckmann, E. C., 17.
 Edelstein, F., 309.
 Edens, W. G., 894.
 Edgerton, C. W., 846.
 Edmonds, M., 60.
 Edmondson, J. B., 815.
 Edson, H. A., 113, 157, 646.
 Edwardes-Ker, D. R., 118, 823.
 Effront, J., 809.
 Egan, M. F., 295.
 Egdaht, Z. P., 598.
 Egenhof, R. L., 588.
 Eggers, W., 139.
 Ehle, H. N., 143, 532, 635.
 Ehrenberg, P., 212, 622.
 Ehrenfels, B. von, 2.
 Ehrhorn, E. M., 53.
 Eichholtz, T., 391.
 Eichhorn, A., 100, 179, 499, 500, 780.
 Eiselt, R., 782.
 Elam, A. W., 442.
 Elbert, J. J., 822.
 Elderton, 67.
 Elias de Molins, J., 595.
 Eliason, B. F., 721.
 Ellbrecht, G., 191.
 Ellenberger, W., 581.
 Ellett, W. B., 623.
 Elliott, C. G., 182.
 Elliott, H., 594.
 Ellis, C., 413.
 Ellis, L. W., 184, 388.
 Ellis, M. M., 828.
 Ellis, O. I., 396.
 Eloire, A., 179, 566.
 Elst, P. van der, 447.
 Elwes, H. J., 747.
 Elwood, P. H., 300, 397.
 Ely, C. R., 761.
 Emberson, R. H., 695.
 Emde, H., 506.
 Emerson, R. A., 333.
 Emery, J. Q., 61.
 Emery, S. C., 510.
 Emery, W. O., 800.
 Emich, F., 801.
 Emigh, E. D., 812.
 Emmerich, R., 565.
 Emmett, A. D., 58, 800.
 Emshoff, E., 582.
 Engler, A., 216, 841.
 Ensor, T. H., 572.
 Entress, E., 178.
 Epstein, A. A., 63.
 Erdozain, E. R., 41.
 Eriksson, J., 50, 152.
 Ernst, W., 877.
 Erpf-Lefkovich, T. A., 66.
 Erwin, A. T., 41, 693, 698.
 Esclangon, E., 667.
 Escobar, N. P., 312.
 Espauillard, N., 640.
 Espy, T. W., 615.
 Essig, E. O., 153, 260, 359, 455, 657.
 Etheridge, W. C., 35.
 Eustace, H. J., 146.
 Eustis, 460.
 Evans, A. C., 75.
 Evans, C. J., 397.
 Evans, C. L., 164, 568.
 Evans, F., 547.
 Evans, I. B. P., 45, 461, 846.
 Evans, J. C., 201.
 Evans, L. B., 598.
 Evans, R. H., 475, 674.
 Evans, W. A., 499.
 Evans, W. D., 98.
 Everest, R. E., 222.
 Everett, G. A., 196.
 Evstifeeva, M. A., 509.
 Ewan, T., 822.
 Ewart, A. J., 524, 733.
 Ewart, J. C., 469, 572.
 Ewert, R., 437, 530, 640.
 Ewing, E. C., 35.
 Ewing, P. V., 300.
 Ewing, S., 1.
 Exner, F. F., 799.
 Eyde, S., 126.
 Eyster, J. A. E., 168.
 Fabre, J. H., 52.
 Fabyan, M., 282.
 Facio, J. P., 315.
 Faes, H., 155, 655.
 Fagan, T. W., 277.
 Fahnion, W., 108.
 Fairchild, D., 42, 698, 753.
 Fairfield, W. H., 222, 271.
 Fairlie, A. M., 517.
 Falk, K. G., 713.
 Fallada, O., 153.
 Fantham, H. B., 761.
 Farcy, L., 58.
 Fargier, 460.
 Farley, A. J., 339, 543.
 Farmer, J. C., 508.
 Farneti, R., 351, 553.
 Faroy, 284.
 Farquhar, H. H., 444.
 Farquharson, C. O., 547, 749.
 Farrington, E. I., 69.
 Fascetti, G., 280.
 Fassett, G. S., 197.
 Fassig, O. L., 120.
 Fauchère, E., 855.
 Faurot, F. W., 97.
 Faville, A. D., 370.
 Fawcett, G. L., 650.
 Fawcett, H. S., 247, 262, 833.
 Feasey, J. E., 495.
 Feder, E., 460.
 Feige, E., 466.
 Feilitzen, H. von, 119, 516, 519, 646.
 Feld, W., 24.
 Fellenberg, T. von, 205.
 Fels, J., 692.
 Felt, E. P., 354, 357, 359, 456, 656.
 Ferdinandsen, C., 345.
 Ferguson, A. M., 193.
 Ferguson, J. E., 16.
 Fergusson, S. P., 813.
 Fernbach, A., 803.
 Ferraris, T., 644.
 Ferris, E. B., 35.
 Ferry, N. S., 682.
 Feruglio, D., 119.

- Fetzner, L. W., 501.
 Feytaud, J., 853.
 Fialho, 2.
 Field, E. C., 153, 347, 647.
 Field, G. A., 892.
 Fields, J., 530.
 Fields, W. S., 396.
 Filley, W. O., 546.
 Finardi, E., 246.
 Fink, D. E., 555.
 Finley, W. W., 291.
 Finlow, R. S., 758.
 Fiori, A., 156.
 Firket, J., 874.
 Fischer, R. C., 139.
 Fish, P. A., 500.
 Fisher, H. C., 661.
 Fisk, W. W., 196.
 Fitch, C. L., 40, 246.
 Fitch, J. B., 575.
 Fitterer, J. C., 812.
 Fitts, E. B., 697.
 Fitzsimmons, M. E., 898.
 Fitzgerald, J. G., 581.
 Fleischhauer, T., 886.
 Fleixhner, E. C., 365.
 Fleming, F. P., 396.
 Fleming, G. B., 171.
 Fletcher, D. U., 691.
 Fletcher, F. F., 84.
 Fletcher, W. A., 84.
 Fletcher, W. F., 237.
 Fleury, A., 582.
 Flint, P. N., 600.
 Flint, R. F., 473.
 Flint, W. P., 58.
 Flora, S. D., 510, 721.
 Florentin, D., 808.
 Floris, G., 378.
 Floyd, B. F., 248.
 Foà, C., 168.
 Foitlik, T., 731.
 Foley, A. W., 471.
 Folin, O., 465, 508.
 Follansbee, R., 511.
 Follett, W. W., 511.
 Folsom, J. W., 555.
 Fontgalland, A. de, 89.
 Fonzes-Diacon, H., 157.
 Forbes, E. B., 506, 799, 807, 861.
 Forbes, S. A., 53.
 Forbush, E. H., 300, 397.
 Ford, (Mrs.) E. F., 362.
 Forel, A., 250.
 Forest, C. R., 698.
 Forgeot, P., 281.
 Fornaini, M., 201.
 Fornet, 581.
 Foster, H. A., 893.
 Fourton, L., 632.
 Foust, J., 867.
 Fowle, F. E., 720.
 Fowler, W. L., 497.
 Fowler, W. W., 57, 358.
 Fox, C. P., 241, 546.
 Fraenkel, W., 822.
 Franchi, A., 571.
 Francis, M. E., 139.
 Frandsen, J. H., 71.
 Frank, E., 476.
 Frank, L. C., 625.
 Fränkel, S., 201.
 Franz, F., 269.
 Franzen, H., 308.
 Fraps, G. S., 317, 416, 796, 801.
 Fraser, J., 286, 382.
 Fraser, W. J., 771.
 Fraser, W. P., 645.
 Frazier, W. H., 794.
 Freak, G. A., 579.
 Frear, W., 798, 800.
 Freckmann, W., 835.
 Fred, E. B., 611, 621, 629, 630, 700.
 Freeman, W. B., 511.
 Frehse, M., 264.
 Freiburger, G., 587.
 French, C., jr., 654, 657.
 French, W. H., 897.
 Frerichs, H., 506.
 Frerichs, K., 361.
 Freund, E., 184.
 Freund, W., 475.
 Fricks, L. D., 659.
 Fridericia, L. S., 869.
 Fridrichsen, E., 373.
 Friedensburg, F., 822.
 Friedheim, C., 801.
 Friedmann, F. F., 884.
 Frier, G. M., 598.
 Friske, K., 514.
 Froggatt, W. W., 338, 558, 656, 761.
 Froley, J. W., 532.
 Fromme, F. D., 698.
 Frost, J. N., 500.
 Frost, V. J., 16.
 Frost, W. H., 560.
 Frothingham, J. P., 441.
 Fruwirth, C., 738.
 Fry, W. H., 19, 515.
 Frye, A. I., 289.
 Fuchs, W., 410.
 Fujioka, M., 344.
 Fullaway, D. T., 252.
 Fuller, C., 758.
 Fuller, H. C., 865.
 Fuller, J. W., 774.
 Fulmer, H., 794.
 Fulton, B. B., 354, 356.
 Fulton, H. R., 49, 646, 647.
 Funk, C., 161, 169, 463, 664.
 Funk, E. D., 633.
 Fürth, O. von, 267.
 Gabathuler, A., 377.
 Gadd, W. L., 184.
 Gahan, A. B., 359.
 Gail, F. W., 794.
 Gaines, W. L., 396.
 Gale, H. S., 518.
 Gallardo, A., 354.
 Galli, E., 765.
 Galli-Valerio, B., 58.
 Galloway, B. T., 144, 603.
 Galluccio, F., 525.
 Galtié, L., 635.
 Gal'tsev, P. E., 419.
 Gamann, H., 86.
 Gammie, G. A., 534.
 Gangoiti, L., 813.
 Ganong, W. F., 420.
 Garbowski, L., 153.
 Gardner, F. D., 215.
 Gardner, M. W., 351.
 Gardner, V. R., 148.
 Garino-Canina, E., 839.
 Garland, J. J., 700.
 Garman, H., 41, 640.
 Gasser, G. W., 735.
 Gates, F. C., 218.
 Gates, L. M., 795.
 Gates, O. H., 899.
 Gates, R. R., 321.
 Gatewood, R., 497.
 Gaucher, E., 285.
 Gaude, W., 368.
 Gaulin, A., 319.
 Gauthier, E., 535.
 Gautier, A., 280, 463, 661.
 Gavin, W., 577, 578, 775.
 Gay, F. P., 174, 581.
 Gayda, T., 715.
 Gaynor, W. J., 868.
 Gearhart, C. A., 700
 Gee, W., 96.
 Gee, W. P., 53.
 Geerligs, H. C. P., 113, 432.
 Geib, W. J., 16, 17, 596, 815.
 Geist, 842.
 Gendre, P. le, 174.
 Gengou, O., 174.
 Génin, C., 244.
 Gentle, G. E., 396.
 Georgeson, C. C., 722, 726, 735, 742, 770.
 Gerlach, 19, 367.
 Gerlaugh, P., 398.
 Gerlei, L., 174.
 Gerneck, R., 449.
 Gernert, W. B., 533.
 Gerresheim, E., 217.
 Gervais, P., 340.
 Gèze, J. B., 522, 531.
 Gibb, R. S., 632.
 Gibbs, H. D., 118.
 Gibson, A., 761.
 Gibson, B. T., 736.
 Gibson, H., 170.
 Gibson, H. H., 441.
 Giddings, N. J., 550.
 Gieseler, E., 893.
 Giesen, I. van, 178.
 Gigon, A., 663.
 Gilbert, A. G., 273.
 Gilbert, A. H., 741.
 Gilbert, B. D., 16.
 Gilbert, G. A., 699.
 Gilbert, W. W., 751.
 Gilchrist, D. A., 474, 752.
 Gildemeister, 882.
 Gile, P. L., 520, 609, 623.
 Giles, W. N., 595, 868.
 Gilg, E., 216.
 Gilkerson, H. C., 396.
 Gilliland, S. H., 499.

- Gilmore, C. A., 186.
 Gilruth, J. A., 780.
 Giltner, W., 80, 82.
 Gimmingham, C. T., 819.
 Gingery, J. B., 97.
 Girard, 869.
 Girola, C. D., 895.
 Girtton, E. S., 697.
 Gisevius, P., 292.
 Gissendanner, A. R., 697.
 Glaister, J., 363.
 Gläser, H., 761.
 Glaser, O., 69.
 Glasgow, G., 699.
 Goddard, H. N., 824.
 Goddard, L. H., 196.
 Godtsenhoven, van, 170.
 Gokhale, V. G., 738.
 Gola, G., 133.
 Goldsmith, P. V., 416.
 Gooch, F. A., 307.
 Good, E. S., 779.
 Goodale, H. D., 69.
 Goodman, A. L., 16.
 Goodnow, E. H., 798.
 Goodspeed, T. H., 320, 739.
 Goodwin, O. T., 697.
 Goodwin, W. H., 87.
 Gooren, G. L. J., 207.
 Gordon, C. H., 209.
 Gordon, G., 441.
 Gordon, J. H., 722.
 Gore, H. C., 798.
 Gorham, S. S., 291.
 Gorham, W. R., 398.
 Gorini, C., 475.
 Görlitz, 482.
 Goss, O. P. M., 43.
 Gossard, H. A., 51, 354.
 Gough, L. H., 654.
 Gouin, A., 65.
 Gould, H. P., 237, 436.
 Gould, R. A., 265.
 Gourley, J. H., 40.
 Gouzien, 460.
 Goy, S., 572, 867.
 Grafe, V., 338, 361.
 Graff, E. T. de, 574.
 Graham, R. R., 88.
 Graham, S. A., 653.
 Graham, W. A., 672.
 Graham-Smith, G. S., 761.
 Gramlich, H., 633.
 Granato, L., 746, 865.
 Grande, I., 373.
 Granderye, L. M., 615.
 Grant, A. S., 473.
 Grant, D., 341.
 Grantham, A. E., 538.
 Grasby, W. C., 817.
 Graves, A. H., 851.
 Graves, R. R., 300.
 Gray, C. E., 585.
 Gray, D. T., 370.
 Gray, G. P., 96, 852.
 Graybill, H. W., 287, 585.
 Greathouse, C. H., 599.
 Greeley, W. B., 444.
 Green, A. W., 428.
 Green, C. R., 299.
 Green, H. H., 164.
 Green, J. Z., 894.
 Green, S. N., 41, 395.
 Green, W. J., 41, 42, 395, 746.
 Greenamyre, H. H., 43.
 Greenaway, A. J., 501.
 Greene, A. M., jr., 390.
 Greenwood, M., jr., 168.
 Grégoire, 104.
 Gregory, C. T., 450.
 Gregory, (Mrs.) E. S., 543.
 Gregory, J. W., 896.
 Greiner, T., 436.
 Grenfell, W. T., 353.
 Grete, A., 810.
 Griffin, A. W., 698.
 Griffin, F. L., 94, 96, 154.
 Griffith, A. S., 583.
 Griffiths, J., 370.
 Griffon, 434.
 Grimbert, L., 568.
 Grimes, W. E., 497.
 Grimmer, W., 775, 805.
 Grimshaw, P. H., 250.
 Griniew, D. P., 663.
 Grisdale, J. H., 222, 235, 271, 278, 775.
 Griswold, D. T., 900.
 Groenewege, J., 246.
 Gróh, J., 671.
 Gröller, L., von, 29.
 Gross, E. R., 97.
 Grossbeck, J. A., 353.
 Grossenbacher, J. G., 248, 526.
 Grosser, P., 160.
 Grosser, W., 151.
 Grotjahn, A., 265, 266.
 Groud, C., 475, 660.
 Grout, J. H., 335.
 Grover, N. C., 487.
 Grubbs, S. B., 651.
 Gruber, E., 477.
 Grunth, P., 377.
 Guasco, M. A., 610.
 Gudeman, E., 867.
 Guicciardini, F., 2.
 Guilliermond, A., 827.
 Gully, E., 124.
 Gümbel, H., 836.
 Gunn, S. M., 280.
 Gunsaulus, E. N., 184.
 Gunter, H., 315, 387.
 Guseman, S., 197.
 Güssow, H. T., 242, 281, 448.
 Gustin, E. E., 193.
 Guthrie, E. S., 98.
 Guthrie, F. B., 213.
 Guyénot, E., 457.
 Gwillim, W. E., 376.
 Haas, A. R., 399.
 Haas, B., 312.
 Hackedorn, H., 870, 872.
 Hadley, P. B., 372, 471.
 Hadlock, W. L., 197, 399.
 Hadwen, S., 357.
 Haecker, A. L., 689.
 Haecker, T. L., 575.
 Haenle, O., 109.
 Haentjens (Mme.), 775.
 Hagemann, E. H., 376.
 Hahner, A. R., 794.
 Haig, K. G., 661.
 Haines, H. H., 643.
 Haines, J. F., 394.
 Halenke, 117.
 Halket, A. C., 731.
 Hall, A. D., 226, 512.
 Hall, E. E., 398.
 Hall, F. H., 40, 42, 474, 838, 878.
 Hall, (Mrs.) J. E., 465.
 Hall, J. G., 848.
 Hall, M. C., 555.
 Hall, M. E., 60.
 Hall, W. T., 506.
 Halligan, C. P., 145, 148.
 Hallock, D. J., 16.
 Halstead, A., 432.
 Halverson, J. O., 59.
 Hamilton, J., 792, 898.
 Hamilton, J. M., 400.
 Hamilton, L. A., 291.
 Hamlin, M. L., 713, 714, 827.
 Hancock, W. C., 215.
 Hand, W. F., 800.
 Hanger, W. E., 193.
 Hannig, E., 134.
 Hansen, D., 32.
 Hansen, H., 693.
 Hansen, N. E., 331.
 Hansen, P., 377.
 Hanslian, R., 64.
 Hanson, H. H., 797.
 Hansson, N., 277, 769.
 Hantsche, P., 586.
 Hanusch, F., 119.
 Hanzawa, J., 59, 161, 245.
 Harcourt, G., 15.
 Harden, A., 714.
 Hardenbergh, J. B., 500.
 Harding, E. P., 507.
 Harding, H. A., 222, 279, 473, 878.
 Harding, S. T., 588.
 Hardison, R. B., 16.
 Hardy, J. I., 796.
 Hare, B. B., 790, 897.
 Hare, C. L., 796.
 Hare, J. H., 70.
 Hare, R. F., 398.
 Haring, C. M., 77, 79, 81, 82, 96, 499, 884.
 Harlay, V., 608.
 Harman, J. A., 85.
 Harper, A. G., 643.
 Harper, M. W., 98, 598.
 Harper, R. M., 513, 746.
 Harris, B. F., 894.
 Harris, J. A., 67, 139, 522, 632, 829.
 Harris, W., 145.
 Harrison, J. B., 416, 417, 644.
 Harrison, J. W. H., 855.
 Harrison, L., 757.
 Harry, S. G., 51.
 Harshberger, J. W., 752.

- Hart, A. K., 397.
 Hart, E., 518.
 Hart, E. B., 65, 66, 792.
 Hart, W. R., 296, 394.
 Härtel, F., 865.
 Harter, L. L., 153, 647.
 Hartley, C. P., 335, 743.
 Hartmann, B. G., 798.
 Hartung, W. J., 54, 257.
 Hartwell, B. L., 417, 419, 570, 626, 823.
 Hartwell, G., 568.
 Haselhoff, E., 219, 371.
 Haseman, L., 354, 655, 838, 854.
 Haskell, L. E., 656.
 Haskell, R. J., 98.
 Haskins, H. D., 820.
 Hastings, E. G., 75, 179.
 Hastings, S. H., 31, 32, 41.
 Hatch, K. L., 298.
 Hatschek, E., 608.
 Hatton, J. H., 543.
 Hauch, L. A., 553.
 Haughs, D., 239.
 Haukelid, B., 593.
 Hauptmann, E., 467.
 Hauska, L., 183.
 Hausner, A., 264.
 Hauxwell, T. A., 444.
 Havelfk, K., 157.
 Hayner, H. H., 885.
 Hawes, A. F., 642.
 Hawk, L. B., 792.
 Hawk, P. B., 267, 268.
 Hawkins, L. A., 528.
 Hawkins, W. J., 400.
 Hawley, L. J., 335, 336.
 Hayden, C. C., 78.
 Hayduck, F., 509.
 Hayes, F. M., 96.
 Hayes, H. K., 31, 536, 737.
 Hayes, W. D., 544, 545.
 Haynes, W., 770.
 Hays, D. W., 400.
 Hazelhoff, E., 535.
 Hazell (Mrs.), S., 364.
 Headen, W. P., 621.
 Headlee, T. J., 559, 653.
 Headley, F. B., 137.
 Heald, F. D., 351, 753, 754.
 Hearn, W. E., 16.
 Heaven, G. S., 613.
 Hecht, C. E., 363.
 Hecht, V., 882.
 Heck, A. F., 396.
 Heckel, E., 409, 829.
 Hector, G. P., 522.
 Hedgcock, G. C., 450, 851.
 Hedrick, U. P., 41, 246, 339, 424, 838.
 Heide, C. von der, 414.
 Heidemann, O., 353, 357.
 Heimann, F., 476.
 Heimbürger, L., 320.
 Heinemann, A., 589.
 Heinly, B. A., 149.
 Heinrich, M., 143.
 Heinricher, E., 352.
 Heintz, W., 205.
 Heiskell, H. L., 414.
 Helitas, G., 167.
 Hellens, O. von, 865.
 Helleputte, 101.
 Heller, A. A., 147, 900.
 Helme, J. W., 463.
 Helvering, G. T., 698.
 Helweg, L., 431.
 Helyar, J. P., 741.
 Henderson, L. J., 62.
 Hendrick, 169.
 Hendrick, J., 474, 668.
 Henneberg, W., 565.
 Henning, E., 357.
 Henrich, G., 121.
 Henry, A., 747, 757.
 Henry, A. M., 362, 462, 766.
 Henry, M., 587.
 Henry, T. A., 503.
 Henshaw, F. F., 84, 210, 511.
 Hepp, K., 266.
 Herbert, T. J., 575.
 Hérissay, H., 509.
 Herke, S., 733.
 Herlitzka, A., 323.
 Herms, W. B., 559, 759.
 Herramhoff, H., 673.
 Herrick, G. W., 253, 556.
 Herrick, S. M., 623.
 Hermann, C. F. von, 314.
 Hermann, E., 530.
 Herron, L. S., 633.
 Herz, 564.
 Herz, F. F., 564.
 Hessler, L. R., 752.
 Hesse, 508.
 Hessler (Mrs.), J. C., 362.
 Hetzel, H. C., 698.
 Heuner, H., 612.
 Hewes, L. I., 388.
 Hewitt, C. G., 252.
 Hewitt, J. L., 640, 649.
 Hewlett, R. T., 278.
 Hibbert, G. H., 375.
 Hibbert, E., 203.
 Hickel, R., 217.
 Hickman, C. W., 399.
 Hickman, R. W., 778.
 Higgins, B. B., 349, 697.
 Higgins, J. E., 234.
 Higley, G. O., 569.
 Hill, A. M., 569.
 Hill, A. V., 568, 569.
 Hill, C., 487.
 Hill, C. J., 71, 96.
 Hill, G. H., 182.
 Hill, G. R., jr., 135, 538.
 Hill, H., 16.
 Hill, H. H., 610, 623.
 Hill, L., 169.
 Hill, M., 643.
 Hillebrand, W. F., 797.
 Hillier, V. F., 208.
 Hills, J. L., 731, 736, 769, 785.
 Hiltner, L., 319, 367, 417, 446, 850.
 Himmelwright, A. L. A., 689.
 Hinderesson, R., 581.
 Hindhede, M., 660.
 Hine, G. S., 879.
 Hirsch, R., 479.
 Hirshfeld, C. F., 891.
 Hissink, D. J., 127, 517.
 Hitchings, E. F., 397.
 Hite, B. H., 731.
 Hittcher, 475, 777.
 Hjortlund, S., 83.
 Hoard, W. D., 70.
 Hoare, E. W., 476.
 Hobbs, C. W., 497.
 Hobday, F., 83.
 Hoc, P., 518.
 Hodges, G. H., 698.
 Hodgkiss, H. E., 354, 355, 356.
 Hoffman, B. E., 342.
 Hoffmann, C., 23, 624, 700.
 Hoffmann, F. W., 794.
 Hoffmann, G. L., 681.
 Hoffmann, M., 811, 821.
 Hoffmann, P., 68.
 Hohenadel, M., 59, 376.
 Holden, W., 121.
 Holderer, M., 505.
 Hole, A. D., 815.
 Hole, R. S., 170, 869.
 Hollande, A. C., 765.
 Holldack, 892.
 Hollingshead, R. S., 697.
 Hollingworth, H. L., 265.
 Holloway, T. E., 52, 53, 658.
 Holme, J. B., 656.
 Holmes, F. S., 645.
 Holmes, G. K., 491.
 Holmes, J. D. E., 176, 783, 883.
 Holmes, L. C., 17.
 Holsendorf, B. E., 651.
 Holt, V. S., 235.
 Holton, E. L., 95.
 Holtz, W., 643.
 Hölzermann, F., 688.
 Honcamp, F., 466.
 Honing, J. A., 136, 345.
 Hoobler, B. R., 366.
 Hood, G. W., 795.
 Hook, J. N., 399.
 Hooker, A. H., 512.
 Hooker, C. W., 652.
 Hooper, C. H., 837.
 Hooper, D., 413, 463.
 Hooper, J. J., 276.
 Hoover, C. L., 564.
 Hoover, C. P., 814.
 Höpfner, W., 411.
 Hopkins, A. W., 399.
 Hopkins, C. G., 397, 623, 698, 727, 820.
 Hopkins, F. G., 164, 169.
 Hopper, H. A., 196.
 Hopson, E. G., 289.
 Hopt, E., 633.
 Horton, A. H., 511.
 Horton, E., 321.
 Hortvet, J., 463, 467, 798, 800.
 Hoskins, R. G., 882.
 Hosmer, R. S., 239.

- Höstermann, G., 837.
 Hotter, E., 308, 530.
 Hough, D. L., 291.
 Houlbert, C., 858.
 Houser, J. S., 257, 757.
 Houston, D. F., 602.
 Hoverstad, T. A., 196.
 Howard, A., 263, 538.
 Howard, A. F., 473.
 Howard, G. L. C., 263.
 Howard, L. O., 357, 656, 758.
 Howe, F. W., 192.
 Howe, G. H., 41.
 Howe, P. E., 268, 664.
 Howlett, F. M., 856.
 Hoyt, J. C., 487.
 Hübner, H., 174.
 Huested, F. P., 288.
 Hughes, E. H., 699.
 Hughes, H. H., 392.
 Hull, N. P., 894.
 Hull, O., 633.
 Humbert, E. P., 620.
 Hume, A. N., 19, 37.
 Humphrey, H. B., 42.
 Humphreys, W. J., 120, 414, 720.
 Hungate, J. W., 495.
 Hungerford, H. B., 354.
 Hunn, C. J., 235.
 Hunt, C. L., 159, 864.
 Hunt, C. W., 86.
 Hunt, T. F., 191, 888.
 Hunt, T. Francis, 96.
 Hunter, A. F., 70.
 Hunter, J., 691.
 Hunter, N., 898.
 Hunter, S. J., 357.
 Hunter, W. B., 386.
 Hurst, C. C., 239.
 Hurst, J. W., 373.
 Hurst, L. A., 16.
 Husmann, G. C., 238.
 Hus, H., 136.
 Hutcheson, T. B., 794.
 Hutchings, W. H., 679.
 Hutchins, R. M., 367.
 Hutchinson, C., 873.
 Hutchinson, C. M., 220, 422.
 Hutchinson, F., 389.
 Hutchinson, H. B., 122, 730.
 Hutchinson, H. P., 142.
 Hutchinson, R. W., jr., 388.
 Hutchison, C. B., 427.
 Hutton, G. H., 222, 271, 272.
 Hutton, J. G., 728.
 Iakushkin, I. V., 418, 419, 624, 625.
 Iddings, E. J., 870.
 Ikenberry, E. A., 97.
 Illingworth, J. F., 55, 560.
 Imbert, A., 174.
 Inchausti, D., 171.
 Inchiostri, H., 482.
 Ingling, W. H., 392, 595, 868.
 Ingram, J. L. Y., 81.
 Ippolito, G. d', 538, 740.
 Irish, J. P., jr., 330.
 Irving, J. N., 588.
 Isaachsen, H., 373, 374.
 Isabolinsky, M., 179, 378, 679.
 Ishikawa, H., 465.
 Israel, H., 294.
 Israelson, O. W., 96.
 Istvánfi, G. von, 350.
 Itô, H., 116.
 Ito, S., 450.
 Ivanov, S. L., 525, 526.
 Iwanoff, E., 66.
 Iwanoff, N., 309.
 Izar, G., 285.
 Jaccard, P., 27, 342.
 Jachevski, A., 243.
 Jack, R. W., 756, 761.
 Jackson, A. M., 25.
 Jackson, H. J., 511.
 Jackson, H. S., 150, 153.
 Jackson, N., 185.
 Jackson, T. J., 91.
 Jacob, M., 500.
 Jacobs, B. R., 160.
 Jacobs, J., 486.
 Jacobson, C. A., 111.
 Jacobstein, M., 691.
 Jaczewski, de, 2.
 Jadin, F., 28, 628.
 Jager, F., 794.
 Jagger, I. C., 646.
 Jakushkine, O. W., 831.
 James, E. A., 291.
 Jamison, A. W., 698.
 Jamison, O. A., 397.
 Jancsó, B., 739.
 Janini, R. J., 356.
 Jaqua, J. H., 121.
 Jardine, J. T., 570.
 Jarrell, T. D., 796.
 Jarvis, E., 657, 759.
 Jatta, M., 884.
 Javillier, M., 28.
 Jefferson, E., 60.
 Jeffery, J. A., 300.
 Jeffries, R. R., 197.
 Jehle, R. A., 848.
 Jekyll, G., 341.
 Jenks, F. B., 597, 700.
 Jennings, A. H., 756.
 Jennings, F. E., 396.
 Jennings, P. J., 85.
 Jensen, E. L., 795.
 Jensen, O., 206.
 Jensen, R., 577.
 Jensen, R. C., 795.
 Jentzsch, A., 495.
 Jepson, F. P., 642.
 Jessen, J. A., 68.
 Jesser, H., 266.
 Jochimsen, L., 15.
 Jodidi, S. L., 124, 316, 723.
 Joest, E., 286, 582, 886.
 Johannsen, 67.
 Johannsen, O. A., 251, 255, 258.
 Johns, F. M., 680.
 Johnson, A. G., 645, 749.
 Johnson, A. K., 661, 865.
 Johnson, A. N., 291.
 Johnson, B. L., 722.
 Johnson, C. W., 353.
 Johnson, E. H., 698.
 Johnson, F., 795.
 Johnson, G. A., 210.
 Johnson, I. B., 600.
 Johnson, J. C., 346.
 Johnson, J. M., 497.
 Johnson, O. R., 465, 490.
 Johnson, W. H., 830.
 Johnson, W. T., jr., 73.
 Johnston, F. A., 261.
 Johnston, J. R., 45, 645, 647.
 Johnston, T. H., 757.
 Jolles, A., 715.
 Jones, C. C., 822.
 Jones, C. H., 115, 736, 769, 785, 797, 800.
 Jones, C. R., 453, 456, 457, 458, 653.
 Jones, C. S., 792.
 Jones, C. V., 463.
 Jones, D. F., 697.
 Jones, D. H., 630.
 Jones, E., 397.
 Jones, E. M., 16.
 Jones, E. R., 589.
 Jones, G. A., 748.
 Jones, G. B., 16, 17, 500.
 Jones, H. A., 510.
 Jones, H. H., 673.
 Jones, J., 748, 812.
 Jones, J. M., 771.
 Jones, Jesse M., 497.
 Jones, J. S., 97, 236.
 Jones, J. W., 373.
 Jones, K. D., 96.
 Jones, L. R., 550, 646.
 Jones, O. L., 700.
 Jones, R. C., 674.
 Jones, S. C., 513.
 Jones, T. H., 356.
 Jones, V. R., 879.
 Jones, W. J., jr., 626, 800.
 Jones, W. N., 421.
 Jong, A. W. K. de, 448, 829, 843.
 Jong, D. A. de, 84.
 Jordan, H. E., 168.
 Jordan, O. A., 195.
 Jordan, S. M., 97.
 Jordan, W. H., 22.
 Joret, G., 822.
 Jorissen, A., 713.
 Joubert, G. F., 897.
 Joutier, E., 632.
 Joyce, A., 400.
 Judkins, H. F., 697.
 Julchiero, A., 778.
 Juritz, C. F., 432.
 Kable, G., 398.
 Kadel, B. C., 121.
 Kahn, F., 131.
 Kahlenberg, L., 792.
 Kajanus, B., 332, 636, 832.
 Kalinkin, S. I., 624, 625.
 Kaliski, D., 676.
 Kalusky, L., 611.
 Kammann, O., 377.

- Kanahara, S., 881.
 Kantschieder, J. S., 119.
 Kapin, O., 716.
 Karczag, L., 504.
 Karraker, R. E., 300.
 Karyž, F., 19.
 Kasdorf, O., 87.
 Kastle, J. H., 397, 823.
 Kaup, J., 265, 266, 341.
 Keeble, F., 219, 421.
 Keegan, P. Q., 434.
 Keghel, M. de, 444.
 Kehoe, D., 377, 476.
 Keilhack, K., 15.
 Keithley, J. R., 580.
 Keller, A. J., 195.
 Keller, C., 169.
 Keller, O., 396.
 Kellerman, K. F., 30, 423, 515, 528, 616.
 Kellert, E., 288.
 Kelley, E., 878.
 Kelley, F. J., 700.
 Kellicott, W. E., 64.
 Kellogg, H. S., 626.
 Kellogg, V. L., 53, 251.
 Kelly, A., 655.
 Kelly, E., 776.
 Kelton, F. C., 484.
 Kemp, W. B., 197.
 Kempton, J. H., 33, 35, 229.
 Kendrick, W. H., 600.
 Kennedy, A., 400.
 Kennedy, P. B., 147, 522.
 Kent, F. L., 197, 300.
 Kent, H. L., 497, 695.
 Kent, R. T., 389.
 Kern, F. D., 398.
 Kern, O. J., 91.
 Kerr, R. H., 204, 798.
 Kerr, W. J., 400.
 Kidner, S., 571.
 Kienitz, 44.
 Kiernan, J. A., 500.
 Kiesel, A., 734.
 Kiesselbach, T. A., 633.
 Kiessling, L., 294, 392, 636.
 Kiger, C. M., 697.
 Kikkawa, S., 535.
 Kilgore, B. W., 320, 522, 821.
 Kille, W. B., 536.
 Kimball, H. H., 121, 314.
 Kimball, J. H., 812.
 Kimball, V. G., 883.
 Kinch, E., 530.
 King, C. L., 492.
 King, F. G., 471.
 King, M. L., 489, 698.
 King, R. L., 396.
 King, W. E., 681.
 King, W. V., 359, 756.
 Kingdon, J. T., 588.
 Kingman, H. E., 500.
 Kinman, C. F., 637.
 Kinney, S. A., 634.
 Kinsley, A. T., 500.
 Kinzel, W., 421.
 Kirchenstein, A., 582.
 Kirchner, O., 845.
 Kirk, J. M., 812.
 Kirkaldy, G. W., 250.
 Kirkpatrick, E. W., 894.
 Kirkpatrick, W. F., 288.
 Kirsch, H., 673.
 Kissling, R., 413.
 Klason, P., 504.
 Klebahn, H., 150.
 Klein, 173, 470, 671.
 Klein, L. A., 500.
 Kleine, R., 446, 759.
 Kligler, I. J., 676.
 Klimmer, M., 584.
 Klinck, L. S., 532.
 Kling, A., 808.
 Klopstock, F., 480.
 Klotz, M., 164, 564.
 Kluyver, A. J., 218.
 Knab, F., 357, 457, 856, 861.
 Knapp, H. B., 196.
 Kneale, R. D., 683.
 Knecht, E., 203.
 Knese, 287.
 Knibbs, G. H., 362, 393.
 Knight, C. S., 138, 900.
 Knight, H. G., 812.
 Knight, L. I., 529, 600.
 Knight, L. J., 131, 132.
 Knobel, E. W., 699.
 Knoll, A. P., 66.
 Knowles, C. H., 642.
 Knudsen, C. W., 196.
 Knudson, L., 132, 196, 343.
 Koch, A., 315.
 Kochetkov, V. P., 319, 418.
 Kochs, 837, 838, 867.
 Köck, G., 646.
 Kodama, H., 378.
 Koenig, W., 810.
 Koepfern, J. H., 469.
 Kohlbrugge, J. H. F., 66, 269.
 Kohlstock, A., 482.
 Kohl-Yakimoff, N., 479, 484.
 Kolbe, L. A., 17.
 Kondo, M., 240.
 Korff, 850.
 Korff-Peterson, A., 881.
 Kornauth, K., 119.
 Korolkov, D. M., 852.
 Koslovskii, G., 858.
 Kossmat, F., 822.
 Kossowicz, A., 28, 29, 30, 133, 765.
 Kossowitsch, P., 625.
 Kostytschew, S., 525.
 Kovácsy, B., 670.
 Kowarzik, R., 469.
 Kracht-Palejeff, P., 286.
 Kraemer, H., 409.
 Krage, 282.
 Kranich, 205.
 Kranich, F. N. G., 389.
 Kränzlin, G., 751.
 Kraus, C., 141.
 Kraus, E. J., 147, 541.
 Krause, F., 46.
 Krause, R., 676.
 Krause, R. A., 868.
 Krauss, F. G., 443.
 Krautstrunk, T., 584.
 Kraybill, H. R., 399.
 Kreis, H., 717.
 Krieger, A., 780.
 Kristensen, M. K., 519.
 Kristensen, R. K., 310.
 Kroemer, K., 437.
 Krug, 117.
 Krüger, B. E., 426.
 Krüger, E., 125, 290, 631, 632.
 Krüger, W., 151.
 Krummacher, O., 166.
 Krusekopf, H., 17.
 Kühl, H., 59, 476.
 Kuhnert, 46.
 Kuijper, J., 218, 250, 351, 439, 552.
 Kunst, F. B., 731.
 Kuttenteuler, H., 412.
 Kyle, O. H., 197.
 Kylin, H., 566.
 La Barre, de, 671.
 La Baume, W., 653.
 La Bergerie, 850.
 Ladd, E. F., 661, 800, 865.
 Ladd, G. E., 196.
 Laer, H. van, 505.
 Laforgue, G., 349.
 Lafon, G., 368.
 Lahitte, E., 188.
 Lahy, J. M., 167.
 Lako, S., 292.
 Lallemant, E. A., 863.
 Lambert, E., 213.
 Lambert, M., 213.
 Lamlin, A., 373, 374.
 Lamon, H. M., 171, 276, 774.
 Lamson, R. A., 794.
 Lan, D., 870.
 Lancaster, S. P., 341.
 Landes, S. W., 399.
 Landsteiner, K., 180.
 Lane, C. H., 91, 93, 400, 897.
 Lang, F., 319.
 Lang, L., 674.
 Lange, W., 840.
 Langelier, G. A., 222.
 Langenbeck, E., 92.
 Langfitt, W. C., 616.
 Langlois, J. P., 174.
 Langworthy, C. F., 159, 200, 462, 766, 864.
 Lantz, D. E., 472.
 Lapparent, H. de, 368.
 Larrass, T., 570.
 Larrison, G. K., 511.
 Larsen, B. R., 138.
 Larsen, C., 774.
 Larsen, O. H., 125.
 Larson, W. E., 597.
 Larue, E. C., 517.
 Larue, P., 730.
 Lassiter, C. T., 291.
 Latimer, W. J., 17.
 La Tourette, L. D., 497.
 Latta, B., 792.
 Laubert, R., 548.

- Laude, H. H., 97.
 Lauder, A., 277, 279.
 Laughton, A. M., 896.
 Launoy, L., 677.
 Laur, E., 101.
 Laurie, D. F., 275, 574, 672.
 Lavarán, A., 77.
 Law, J., 478.
 Lawrence, W. H., 396.
 Lawry, R. C., 293.
 Laws, H. E., 680, 886.
 Lawton, F. B., 497.
 Laymon, H. B., 672.
 Lazansky, E., 291.
 Lazenby, W. R., 41.
 Leach, A. E., 204.
 Leake, J. M., 263, 433.
 Leather, J. W., 514.
 Leavenworth, C. S., 408.
 Leaver, J. M., 240.
 Lebbin, G., 864.
 Lebœuf, A., 457.
 LeClerc, J. A., 160, 322, 835.
 Leclerc du Sablon, 524.
 Lecointre, G., 592.
 Le Conte, 869.
 Lederle, E. J., 473.
 Lee, O., jr., 16.
 Leeney, H., 476.
 Leese, J. S., 488.
 Lefkovich, T. A. E., 66.
 Lefroy, H. M., 854.
 Leftejew, V. A., 852.
 Legault, A., 150.
 Legendre, A. F., 655.
 Le Gendre, P., 174.
 Lehmann, A., 768.
 Lehmann, E., 525, 665.
 Leidigh, A. H., 395, 428, 600.
 Leiper, R. T., 889.
 Lejars, F., 174.
 Lemeland, P., 112.
 Lemoigne, M., 826.
 LeNoir, P., 174.
 Leonard, L. T., 423, 515.
 Leonard, W. A., 517.
 Leonardi, G., 757.
 Leperre, F., 206.
 Lepeschkin, W. W., 27.
 Lepierre, C., 28, 422, 628.
 Le Renard, A., 734.
 Lesage, P., 218.
 Lett, W. L., 16.
 Lewallen, W. M., 585.
 Lewis, C. I., 147, 148.
 Lewis, F. J., 134.
 Lewis, H. G., 17.
 Lewis, H. R., 498, 574.
 Lewis, L. L., 193.
 Lewis, R. C., 476.
 Lewis, R. G., 344, 843.
 Lhéritier, A., 482, 582.
 Liautard, A., 301, 498.
 Libby, G. L., 193.
 Lichtenfelt, 162.
 Lichtenheld, G., 666.
 Lignéres, 886.
 Lille, F. R., 167, 371.
 Lindemann, E. A., 382.
 Lindemuth, J. R., 318, 519.
 Linden, 481.
 Lindhard, E., 431.
 Lindholm, P. W., 598.
 Lindley, R. T., 510.
 Lindsay, D. E., 464.
 Lindsay, F., 342.
 Lindsey, J. B., 876.
 Linfield, J. H., 613.
 Linholmberg, E., 198.
 Link, G. K. K., 47, 48.
 Lint, H. C., 498.
 Lintner, C. J., 716.
 Lipman, C. B., 31, 96, 317.
 Lipman, J. G., 126, 417.
 Lipp, C. C., 794.
 Lissone, E. G., 553.
 Lister, R. A., 895.
 Listoe, S., 693.
 Livermore, K. C., 98.
 Livingston, B. E., 217, 627, 719.
 Lloyd, F. E., 264.
 Lloyd, F. J., 375.
 Lloyd, J. W., 41, 94.
 Lloyd, W. A., 196.
 Lloyd-Jones, O., 700.
 Löckermann, 595.
 Lodge, F. A., 342.
 Löffler, F., 283, 379.
 Loew, O., 520, 528, 565, 622, 815.
 Loew, W., 29, 30, 133.
 Loftin, U. C., 396.
 Logan, W. N., 416.
 Löhnis, F. B., 666.
 Lombard, G., 291.
 Lombroso, U., 268.
 Lonay, 105.
 Lonergan, W. W., 634.
 Long, C. M., 97.
 Long, D. D., 16.
 Long, G. R., 444.
 Long, J., 337.
 Long, J. H., 763.
 Long, W. H., 44.
 Lonsdale, T. W., 772.
 Loomis, A. M., 692.
 Loomis, H. M., 799.
 Loomis, J. C., 475.
 Lopez, J., 198.
 Lorand, A., 267.
 Lorenz, R., 564.
 Loringa, G., 884.
 Loske, E. G., 811.
 Loughridge, R. H., 415.
 Louis-Dop, 2.
 Lounsbury, C., 16, 17.
 Lounsbury, C. P., 657, 756.
 Love, H. H., 635.
 Loveland, G. A., 510.
 Lovett, A. L., 158.
 Lowry, M. W., 697.
 Loy, S. K., 399.
 Lubarsch, O., 174.
 Lubin, D., 1.
 Lucas, 577.
 Luciani, L., 168.
 Luedecke, 185.
 Luhs, T., 582.
 Luijk, A. van, 151.
 Lumsden, J., 162.
 Lushington, A. W., 342.
 Lushington, P. M., 342.
 Lüstner, G., 547.
 Lutman, B. F., 550.
 Lutz, A., 54.
 Lykes, H. P., 300.
 Lynde, C. J., 124.
 Lyne, R. N., 843.
 Lynn, E. V., 600.
 Lyon, T. L., 22, 212, 317, 818, 820.
 Lythgoe, H. C., 799.
 McAdie, A. G., 121, 200, 415, 510, 511, 721, 722, 812.
 McAlister, C., 371.
 Macallum, A. B., 466.
 McAlpine, D., 246, 542.
 McArthur, C. L., 396.
 McAtee, W. L., 452.
 McBeth, I. G., 527, 528, 817.
 Macbride, T. H., 626.
 McBryde, R. V., 196.
 McCall, A. G., 737.
 McCampbell, C. W., 873.
 McCartney, H. E., 689.
 McCharles, C. H., 96.
 McClelland, C. K., 224, 270, 633, 784.
 McClelland, E. H., 630.
 McClelland, T. B., 641.
 McClintock, C. T., 679.
 McClintock, J. A., 154.
 McCloskey, A. G., 196.
 McClure, H. B., 532.
 McCulloch, J. W., 653, 854.
 McCollum, E. V., 64, 664.
 McConnell, P., 370.
 McCormick, E. B., 699.
 McCready, J. E. B., 774.
 McCue, C. A., 40, 41, 744, 791.
 McCullough, C. B., 786.
 McDanell, L., 794.
 McDonald, A. H. E., 595.
 McDonnell, H. B., 520, 522, 796.
 McDougall, A. F., 300, 397.
 McDowell, F. N., 498.
 McFadyean, J., 179, 481, 582.
 McGeorge, W., 203, 208, 210, 212, 233, 241, 615.
 McGill, A., 59, 60, 361, 462, 463, 766, 769, 880.
 McGillivray, J. H., 239.
 Macginnis, P., 587.
 McGowan, J. P., 81, 179, 681.
 McGregor, E. A., 360.
 McGrew, T. F., 193.
 McIntire, C., 31, 137, 700.
 McIntire, W. H., 796, 797.
 Mackay, A., 222.
 McKay, M. B., 48.
 McKee, R., 33.
 McKeene, (Mrs.) H. A., 362.
 McKeever, W. A., 362.
 McKerral, A., 736.
 McKillican, W. C., 222, 271.

- Mackintosh, R. S., 794.
 McLachlan, A., 36.
 Maclaren, W. F. de B., 644.
 McLaughlin, A. J., 512.
 McLean, H. C., 797.
 McLean, W. A., 291.
 McLendon, C. A., 697.
 McLendon, W. E., 16.
 McLeod, A. E., 656.
 McLeod, F. H., 766.
 McLeod, J. A., 697.
 McMaster, A. B., 564.
 McNaughton, J., 777.
 Macneilage, A., 469.
 McNeill, A., 340, 838.
 MacNider, G. M., 467.
 McOmie, A. M., 426.
 Macoun, W. T., 40, 235.
 McPeck, C., 882.
 Macpherson, A., 367, 427.
 McRae, W. A., 567, 869.
 McSwiney, J., 830.
 McWilliams, C. K., 399.
 McWilliams, C. M., 97.
 McWilliams, J. E., 600.
 Madden, I. A., 91.
 Maddox, R. S., 398.
 Madsen, V., 693.
 Madsen-Mygdal, A., 809.
 Madson, B. A., 96.
 Maenhaut, J., 201.
 Maggio, C., 757.
 Maggiora, R., 884.
 Magnan, A., 476.
 Magne, H., 663.
 Magnien, A., 639.
 Magnus, P., 345.
 Magnus, W., 442.
 Magoon, C. A., 399.
 Magrou, 243.
 Magruder, E. W., 799.
 Magruder, W. T., 389.
 Mai, C., 810.
 Maignon, F., 868.
 Main, J., 399, 597, 900.
 Maire, E., 240.
 Mairs, T. I., 395.
 Makrinoff, J. A., 877.
 Malden, W., 761.
 Malden, W. J., 369.
 Malkmus, B., 597.
 Malm, E. A., 516.
 Malpeaux, L., 23.
 Malthouse, G. T., 448.
 Malvezin, P., 264.
 Mameli, E., 323, 551.
 Mammen, H., 480.
 Man, J. G. de, 360.
 Manaresi, A., 437.
 Mangan, D. J., 175.
 Mangum, A. W., 17, 486, 815.
 Manikowske, W., 788.
 Mann, C. J., 16, 17, 815.
 Manning, A., 673.
 Manns, T. F., 195, 352, 450.
 Manrique, P., 198.
 Maquenne, L., 27.
 Marchoux, E., 563.
 Marcis, A., 284.
 Marcus, E., 609.
 Marcusson, J., 811.
 Mardon, A. C., 573.
 Marean, H. W., 815.
 Marescalchi, A., 439.
 Marion, 413.
 Marker, C., 375.
 Marks, G., 183.
 Marras, F. M., 679.
 Marrassini, A., 168.
 Marre, E., 551.
 Marriage, E., 60.
 Marsden, E. J., 868.
 Marsh, C. D., 280.
 Marsh, H., 280.
 Marsh, H. O., 455.
 Marshall, C. J., 499, 500.
 Marshall, F., 821.
 Marshall, F. H. A., 772.
 Marsteller, R. P., 889.
 Marston, A., 290, 685.
 Martel, H., 880.
 Marti, W. C., 397, 718, 796.
 Martin, A., 83.
 Martin, C. H., 316.
 Martin, C. J., 108, 501, 502.
 Martin, G. L., 93.
 Martin, G. W., 498, 847.
 Martin, H. H., 510, 812.
 Martin, J. N., 829.
 Martin, J. W., 289.
 Martin, O. B., 93.
 Martin, W. F., 511.
 Martin, W. J., 500.
 Martindale, W. H., 580.
 Martinez, L., 155.
 Martinez, R. S., 749.
 Martini, P., 807.
 Martiny, B., 172.
 Martynov, M., 813.
 Marvin, C. F., 896.
 Marx, K., 491.
 Maskew, F., 54.
 Mason, A. C., 396.
 Mason, C. D., 866.
 Mason, D. B., 519.
 Mason, F. E., 676.
 Mason, P. W., 395.
 Massee, G., 751.
 Massee, I., 844.
 Massey, A. B., 195.
 Massol, L., 583.
 Mathers, F., 320.
 Matheson, W., 200.
 Mathews, E., 673.
 Mathews, J. W., 470, 669.
 Mathewson, W. E., 11, 12.
 Matignon, C., 822.
 Matsunaga, S., 263.
 Matthes, H., 205.
 Matthews, F. P., 169.
 Matthews, J., 898.
 Matthews, M. L., 395.
 Matthews, W. C., 794.
 Matz, J., 396.
 Maublan, A., 848.
 Maximow, A., 217.
 Maxwell, F., 536.
 Maxwell, H., 441, 644.
 Maxwell-Lefroy, H., 758, 854.
 Mayer, A., 309, 315, 767.
 Mayer, G., 64.
 Maynadier, G. B., 16, 17.
 Maynard, L. A., 700.
 Maynard, T. P., 822.
 Mayne, D. D., 298.
 Mayné, R., 857.
 Mayo, N. S., 197, 499, 500, 880.
 Mazé, P., 325, 525, 826.
 Meade, R. K., 890.
 Meade, R. M., 36.
 Meggitt, A. A., 816.
 Mehta, G. D., 738.
 Meier, W. H. D., 792.
 Meikle, R. V., 588.
 Meisner, H., 597.
 Melander, A. L., 42, 197, 358, 657.
 Melchers, L. E., 699.
 Melhus, I. E., 347, 447, 550, 646.
 Méline, J., 101.
 Mellanby, J., 662.
 Mellet, R., 503.
 Mellon, B. H., 587.
 Melvin, A. D., 778.
 Memminger, L., 319.
 Mendel, L. B., 62.
 Mendoza, P. C., 870.
 Menegaux, A., 172.
 Mensching, J. E., 506, 807, 861.
 Mer, E., 240.
 Merrilat, E., 500.
 Merkat, von, 88.
 Merkel, F., 228.
 Merrill, C. L., 400.
 Merrill, F. H., 497.
 Merriman, G., 55.
 Merry, J. F., 189.
 Merz, A. R., 519.
 Merzbacher, G., 415.
 Mesnil, F., 77.
 Messerschmidt, T., 484.
 Messier, P., 821.
 Mestdag, E., 336.
 Metalnikow, G. J., 481.
 Metcalf, C. L., 456.
 Metcalf, H., 451.
 Metcalf, Z. P., 52.
 Metzger, 343.
 Metzger, K., 480.
 Meunier, A., 842.
 Meunier, L., 116.
 Meyer, A., 324.
 Meyer, A. H., 17.
 Meyer, F. N., 424, 753.
 Meyer, H., 811.
 Meyer, K., 782.
 Meyer, K. F., 500, 677, 889.
 Meyer, L. F., 62.
 Meyer, R., 174.
 Meyers, A. A., 289.
 Meyrick, E., 250, 251.
 Meysey-Thompson, R. F., 573

- Mezes, S. E., 894.
 Mezger, O., 266.
 Miatello, H., 599.
 Michaelis, M., 364.
 Michalke, O., 341, 598.
 Micheels, H., 218.
 Mickle, G. R., 873.
 Miehe, H., 30.
 Mielck, O., 820.
 Migula, W., 325.
 Miklauz, R., 214.
 Miklóš, de E., 105.
 Milam, A. B., 661.
 Milbraith, D. G., 645.
 Miller, B., 362.
 Miller, F. A., 31.
 Miller, F. W., 394.
 Miller, L. K., 400, 495.
 Miller, M. F., 427, 796.
 Miller, O. C., 497.
 Miller, Z. K., 185.
 Milligan, J. C., 84.
 Mills, E. C., 485.
 Milne, H., 186.
 Milne, J., 420.
 Milner, R. D., 462.
 Milner, R. T., 197.
 Minchin, E. A., 360.
 Minett, E. P., 16.
 Minett, F. C., 481.
 Minkler, F. C., 498.
 Miskimen, M., 898.
 Misson, L., 368, 428.
 Mitchell, A. J., 721.
 Mitchell, D. T., 476.
 Mitchell, J. F., 96.
 Mitchell, L. C., 263.
 Mitchell, P. V., 699.
 Mitchell, R. V., 472.
 Mitchell, W. A., 812.
 Mitzmain, M. B., 760.
 Miyake, K., 411, 803.
 Möbius, M., 554.
 Mobley, H. S., 894.
 Moebius, F., 833.
 Mohler, J. R., 179, 301, 498, 499, 587, 779, 780.
 Mohr, E., 819.
 Mohr, O., 107.
 Mohs, K., 60, 567.
 Molinas, E., 654.
 Molins, J. E. de, 595.
 Molisch, H., 131.
 Molliard, M., 222, 629.
 Molz, E., 151, 446.
 Mondschein, J., 309.
 Mongrell, L., 179.
 Monrad, J. H., 376, 777.
 Monro, A. V., 149.
 Montemartini, L., 553.
 Montgomery, E. G., 38, 196, 534.
 Moody, F. B., 196.
 Moody, J. F., 745.
 Mooers, C. A., 25.
 Moon, V. H., 883.
 Mooney, C. N., 16, 17.
 Moore, H. W. B., 756.
 Moore, J. H., 291.
 Moore, P. H., 222, 278.
 Moore, W., 356, 794.
 Moran, C. F., 775.
 Moreau, 434, 655.
 Moreau, L. F., 660.
 Morgan, A. C., 356, 359.
 Morgan, D. N., 96.
 Morgan, H. A., 98.
 Morgan, H. H., 182, 712.
 Morgan, J. J., 387.
 Morgulis, S., 869.
 Mörlar, A., 378.
 Morrill, A. W., 341, 453, 852.
 Morris, A., 264.
 Morris, C. R., 689.
 Morse, S. F., 396.
 Morse, W. J., 141, 145, 448.
 Morstatt, H., 645, 853.
 Mortensen, M. L., 734.
 Morton, G. E., 871, 872.
 Morton, O. A., 695.
 Morton, W. E., 689, 899.
 Moss, A. E., 753.
 Mosséri, V., 684.
 Mote, D. C., 82.
 Mouglin, P., 842.
 Moussu, G., 284.
 Müller, 2, 581.
 Müller, E. van der Feen, 473.
 Müller, G., 580, 731.
 Müller, H. C., 151.
 Muller, J., 487, 586.
 Müller, L., 244.
 Müller-Thurgau, 209.
 Mulligan, C. A., 465.
 Mulon, P., 174.
 Mulraj, 44.
 Mumford, A. A., 364, 464.
 Mumford, F. B., 420, 626, 670, 696, 838, 899.
 Mumma, E. W., 794.
 Munerati, O., 151.
 München, J., 680.
 Munn, M. T., 40.
 Munro, W. A., 222.
 Munson, T. V., 41.
 Münster, F., 222.
 Müntz, A., 26.
 Murdock, H. E., 890.
 Murphy, D. W., 683.
 Murphy, E. C., 788.
 Murphy, J. B., 385.
 Murphy, P. A., 846.
 Murphy, R. M., 879.
 Musback, F. L., 17.
 Musser, K. B., 497.
 Musto, A. A., 592.
 Mutchler, F., 397.
 Muth, F., 49, 641.
 Myers, M. A., 92.
 Myers, M. R., 894.
 Mygdal, A. M., 809.
 Myrick, H., 894.
 Naegler, W., 19.
 Nakayama, S., 258.
 Napier, T., 822.
 Nastold, K., 141.
 Naumann, A., 48.
 Navrotsky, N. N., 483.
 Neal, J. W., 726, 735, 770, 790.
 Nedokuchaev, N., 318.
 Neger, F. W., 651.
 Nègre, L., 581, 582.
 Nehrling, A. H., 840.
 Neidig, R. E., 712.
 Neill, N. P., 815.
 Nelson, A. E., 534.
 Nelson, J. W., 17.
 Nelson, M., 300.
 Nelson, O. M., 300.
 Nelson, S. B., 197.
 Neresheimer, E., 731.
 Neuberg, C., 120.
 Neüls, J. D., 459.
 Neumann, M. P., 60, 565.
 Neumann, R., 807.
 Neumark, 883.
 Neville, A., 164.
 Newell, F. H., 683.
 Newell, H. D., 290.
 Newell, W., 259, 563, 859.
 Newhall, V. A., 684.
 Newlin, C. I., 396.
 Newman, H. H., 755.
 Newman, J. W., 397.
 Newman, L. H., 636.
 Nichol, (Mrs.) R. W., 465.
 Nicholls, L., 768.
 Nichols, C. S., 786.
 Nichols, E. S., 510.
 Nichols, F. G., 792.
 Nichols, G. E., 826.
 Nichols, J. E., 590.
 Nickels, L. J., 96.
 Nicolas, E., 412.
 Nicolle, C., 479.
 Nieberle, C., 888.
 Niklas, H., 123.
 Nilsson-Ehle, H., 143, 532, 635, 739.
 Nixon, C., 273.
 Noaks, E. W. L., 569.
 Nobbs, E. A., 273.
 Nockmann, E., 311, 564.
 Noel, P., 555, 556, 853.
 Noël-Paton, F., 789.
 Noffray, E., 245.
 Nogier, T., 174.
 Noir, P. le, 174.
 Nolan, A. W., 598, 791.
 Norris, R. V., 166.
 North, C. E., 473.
 Northrup, Z., 8.
 Norton (Mrs.), A. P., 362.
 Norton, G. F., 673.
 Norton, J. B. S., 146, 436, 848.
 Norys, M. V., 70.
 Novelli, N., 548.
 Nowacki, K., 483.
 Nowak, H., 810.
 Noyes, H. A., 698.
 Nüsslin, O., 863.

- Nuttall, G. H. F., 58, 883.
 Nuttall, W. H., 579.
 Nye, L. L., 507.
 Nystrom, A. B., 878.
 Nyström, E., 641.
 Oakley, R. A., 428.
 Oates, W. R., 239.
 Ober, F. A., 200.
 O'Brien, R. A., 682.
 Ocock, C. A., 700.
 Odell, G. T., 99.
 Odle, I. D., 396.
 Oes, A., 133.
 O'Gara, P. J., 848.
 Ogilvie, J. P., 613.
 Oglesby, W. F., 96.
 Ohlmer, W., 831.
 Ohly, C., 665.
 Okazaki, B., 813.
 Olberg, C. R., 889.
 Olding, E. E., 85.
 Oliva, A., 880.
 Oliver, H. T., 293.
 Olivier, S., 105.
 Olney, R., 688.
 Olson, G. A., 875.
 Olson, J. C., 397.
 Olson, P. J., 794.
 Omeis, T., 117.
 Omeliansky, W., 528.
 O'Neal, E., 294.
 O'Neil, C. J., 376.
 Opperman, C. L., 276.
 Oppermann, A., 343.
 Ordway, T., 288.
 Orelli, O. S., 858.
 Ormsbee, E. J., 197.
 Oro, J. de, 198.
 Orth, J., 479.
 Orton, C. R., 750.
 Orton, W. A., 246, 549, 646.
 Orwin, C. S., 293.
 Osborn, H. F., 67.
 Osborn, L. W., 697.
 Osborn, W. C., 868.
 Osborne, C. B., 687.
 Osborne, J. B., 362.
 Osborne, T. B., 62, 408, 501, 798.
 O'Shea, M. V., 597.
 Oshima, K., 308.
 Oskamp, J., 439.
 Osler, H. S., 195.
 Osmaston, B. B., 444.
 Osner, G. A., 751.
 Ossat, G. de A. d', 19.
 Osterhout, W. J. V., 134, 627, 628.
 Ostertag, R., 174.
 Osterwalder, A., 49, 50, 116, 209.
 Ostrander, J. E., 121, 415, 722, 812.
 Otis, C. H., 43.
 Otlet, R., 365.
 Ottenwälder, A., 525.
 Otto, R., 547.
 Ousley, C., 596.
 Oviatt, C. J., 399.
 Owen, W. L., 190, 317.
 Oxford, A. W., 567.
 Oyuela, A. M., 677.
 Paddock, F. B., 54, 859.
 Paddock, W., 395, 694.
 Page, H. L., 197.
 Page, J. H., 367.
 Page, L. W., 890.
 Palejeff, P. K., 286.
 Palkin, S., 800.
 Palladin, W., 324.
 Palmaer, W., 128.
 Palmer, A. H., 120, 721.
 Palmer, C., 93, 195.
 Palmer, C. C., 794.
 Palmer, G. T., 617.
 Palmer, L. S., 699.
 Palmer, R. C., 544.
 Palmer, T., 573.
 Palmer, T. S., 555, 852.
 Palmer, W. W., 62.
 Pammel, L. H., 445, 637.
 Panisset, L., 681.
 Pantanelli, E., 150, 156, 238.
 Pape, F. A. G., 840.
 Pappel, A., 278.
 Paraschtschuk, S., 172.
 Paris, G., 117.
 Parker, E. G., 318.
 Parker, F. F., 682.
 Parker, G. L., 84, 210.
 Parker, H. N., 880.
 Parker, W. B., 254, 261.
 Parkin, G., 507.
 Parks, T. H., 857.
 Parlour, W., 171.
 Parman, D. C., 356.
 Parnas, J., 63.
 Parow, E., 414, 509.
 Parr, S. W., 617.
 Parrott, P. J., 252, 354, 355.
 Parshall, A. J., 84.
 Passerini, N., 433.
 Passos, J. R. dos., 90.
 Pastur, 103.
 Patch, E. M., 259, 654.
 Pate, W. F., 498.
 Paterson, J. W., 214.
 Paton, D. N., 464.
 Patouillard, N., 752.
 Patten, A. J., 718, 795, 796.
 Patterson, H. J., 366.
 Patton, C. A., 722.
 Patton, W. S., 762.
 Paturel, G., 529.
 Patzewitsch, B., 179, 378.
 Paul, A. E., 798.
 Paul, C. H., 183.
 Paul, J. H., 399.
 Pawlenko, A., 110.
 Peacock, R. W., 845.
 Pearce, N. D. F., 251.
 Pearl, R., 774, 830, 874.
 Pearson, 67.
 Pearson, G. A., 531, 544, 545.
 Pearson, R. S., 43, 240, 440.
 Peche, K., 133.
 Peck, C., 197, 498.
 Pedersen, J., 173.
 Peirce, G. J., 421.
 Pelton, W. C., 41, 697, 744.
 Penberthy, J., 676.
 Penning, C. A., 368.
 Pennington, M. E., 87, 472.
 Periturin, F. T., 319.
 Perkins, A. E., 674.
 Perkins, R. C. L., 250, 251.
 Perlich, H., 884.
 Perrier, G., 58.
 Perrot, E., 340.
 Petch, T., 351.
 Peters, F., 801.
 Peters, F. H., 84, 683.
 Peters, J., 473.
 Peters, L., 550.
 Peters, T. W., 295.
 Petersen, K. D., 433.
 Peterson, A. K., 881.
 Peterson, E. G., 819.
 Peterson, F. L., 138, 900.
 Peterson, S. P., 121.
 Peterson, W. A., 330, 338.
 Petersson, G. T., 580.
 Pethybridge, G. H., 448, 549, 550
 846.
 Petit, A., 19.
 Petit, G., 326.
 Petri, L., 156, 349.
 Petry, E. J., 570.
 Pettipher, J., 471.
 Pettit, M., 57.
 Pettit, R. H., 146.
 Pfeiffer T., 316, 514, 520, 824.
 Pfeiler, 378.
 Pfeiler, W., 482.
 Pfister, G. A., 315.
 Phalen, W. C., 519.
 Phelan, J., 894.
 Phillips, A. G., 395.
 Phillips, A. J., 686.
 Phillips, H. M., 488.
 Picard, F., 756, 758, 854, 855.
 Pichenaud, 434.
 Pick, H., 268.
 Pickens, J. M., 896.
 Pickering, S. U., 339, 638.
 Pickett, B. S., 437.
 Pieper, 50.
 Pierce, C. H., 511.
 Pierce, H. C., 87, 472.
 Pierce, R. G., 43, 755.
 Pierce, W. D., 562, 761.
 Pietsch, W., 247.
 Pilkington, B., 534.
 Pillado, J. A., 171.
 Pillers, A. W. N., 384.
 Piña, S., 808.
 Pincussohn, L., 567.
 Pinkerton, T. C., 517, 730.
 Pinn, A. J., 338.
 Pinoy, 243.
 Pioda, 2.
 Piper, C. V., 229, 233, 424.
 Pitcher, C. S., 463.
 Pitsch, O., 531.
 Place, F. E., 66.
 Plimmer, R. H. A., 166.
 Plum, H. M., 795.
 Plumb, C. S., 69, 398, 572.

- Plunkett, H., 894.
 Plymen, F. J., 736.
 Poe, C., 392.
 Poels, J., 377.
 Poher, E., 293.
 Poincaré, H., 702.
 Pole, R., 442.
 Pollacci, G., 28.
 Pollock, J. B., 220.
 Pool, V. W., 47, 48.
 Poole, J. P., 497, 699.
 Popence, E. A., 699.
 Popenoe, F. W., 42.
 Popp, M., 409, 410.
 Porcher, C., 777.
 Porchet, F., 810.
 Portchinsky, I. A., 760, 761.
 Porter, A., 761.
 Porter, C. E., 58.
 Porter, W. R., 690.
 Poskin, P., 510.
 Postiff, W., 145.
 Postius, J. A. y, 162.
 Potter, A. A., 893.
 Potter, E. L., 300.
 Potter, G. F., 700.
 Potter, R. S., 698.
 Potts, R. C., 876.
 Pouchet, 659.
 Pouget, I., 628, 732.
 Powell, G. H., 89, 440.
 Powell, S. V., 495.
 Powers, W. L., 181.
 Pozzi, de, 2.
 Pranke, E. J., 24, 517, 518.
 Prasad, R., 433.
 Pratt, D. B., 96.
 Pratt, D. S., 161.
 Pratt, J. H., 182, 183, 687.
 Prescott, S. C., 722, 814.
 Prianchnikov, D., 133.
 Price, H. C., 113, 200, 393, 700.
 Price, H. L., 638.
 Price, S. R., 847.
 Friday, F. M., 675.
 Principi, P., 416.
 Prinsen Geerligs, H. C., 113, 432.
 Promsy, G., 26.
 Pröscholdt, O., 285.
 Prucha, M. J., 228.
 Prunet, A., 349.
 Przibram, H., 167.
 Pucci, C., 68, 69.
 Puchner, H., 788.
 Pugsley, C. W., 1, 332, 633, 694.
 Purvis, M., 472.
 Pusch, G., 570.
 Putnam, J. J., 733.
 Putnam, X. W., 86.
 Puy, W. A. du, 329.
 Pyle, G. L., 498.
 Pyre, W. H., 140.
 Quaintance, A. L., 54, 353.
 Quanjier, H. M., 347.
 Quayle, H. J., 158, 262.
 Quick, F., 465.
 Quimby, E. F., 656.
 Quinn, E. J., 815.
 Quinney, J., jr., 99.
 Rabak, F., 13.
 Radford, W. A., 186.
 Rahn, O., 20, 123, 563, 817.
 Rail, E., 97.
 Raitsits, E., 477.
 Rakoczy, A., 665.
 Rama Rao, M., 546.
 Rambaud, B., 895.
 Ramirez, R., 245.
 Ramirez, S., 198.
 Ramsay, A. A., 467.
 Ramsower, H. C., 700.
 Ranck, E. M., 676.
 Randlett, G. W., 196.
 Rankin, W. H., 649, 651.
 Ransom, B. H., 82, 555, 586, 782, 886.
 Rassow, B., 501.
 Rather, J. B., 800, 801, 804.
 Rätz, S. von, 81.
 Raudnitz, R. W., 775.
 Ravaz, L., 155, 238, 350, 551.
 Ravenel, M. P., 499.
 Ravn, F. K., 553.
 Rawitscher, F., 46.
 Rawl, B. H., 896.
 Ray, B. J., 76.
 Raynaud, 581, 582.
 Raynor, R., 473.
 Read, H. L., 417.
 Read, J. M., 168.
 Recknagel, A. B., 342, 842.
 Reddick, D., 245, 247, 650, 753.
 Reddie, C., 364.
 Redman, R. W., 195, 397.
 Reed, H. S., 645, 647, 648.
 Reed, O. E., 575.
 Reed, T. R., 812.
 Reed, W. G., 510, 511.
 Reed, W. V., 557.
 Reenen, R. J. van, 684.
 Rees, R. W., 41, 94.
 Reeves, F. S., 41.
 Reich, R., 863.
 Reichel, J., 287.
 Reid, J. A., 543.
 Reinders, E., 422.
 Reinhardt, R., 881.
 Reinicke, T. G. W., 737.
 Reinke, W. B., 786.
 Reitter, E., 859.
 Remington, R. E., 866.
 Remsen, I., 762.
 Remy, T., 539.
 Renard, A. le, 734.
 Renvall, A., 442.
 Retherford, W. O., 595.
 Rettger, L. F., 288.
 Rettie, T., 81, 179, 681.
 Revis, C., 278, 723.
 Rey, P., 510.
 Reynolds, D. M., 499.
 Reynolds, M. H., 382, 750.
 Rezek, I., 390.
 Rheinberger, E., 810.
 Rice, T. D., 17.
 Richards, E. H., 496.
 Richards, J. W., 127.
 Richards, M. V., 182.
 Richards, P., 660.
 Richardson, C. H., jr., 359.
 Richardson, E. L., 467.
 Richmond, H. D., 673.
 Richmond, W. A., 721.
 Ricker, P. I., 327.
 Ricks, J. R., 35.
 Rideal, S., 802.
 Ridgway, C. S., 195, 326.
 Ridgway, R., 762.
 Ridlon, J. R., 651.
 Riedel, J. D., 503.
 Rieger, J. B., 265.
 Riehm, E., 47, 548.
 Rigg, G. B., 322, 523, 643.
 Rigotard, L., 60.
 Rigotard, M., 60.
 Riley, J. G., 798.
 Ringelmann, M., 185.
 Ringer, A. I., 62, 365.
 Rinkle, L. G., 879.
 Rippel, A., 217.
 Risser, A. K., 473.
 Ritter, C. A., 823.
 Ritthausen, H., 501.
 Ritzman, E. G., 631, 666, 900.
 Rivière, C., 281.
 Roadhouse, C. M., 96.
 Roark, R. C., 797.
 Robb, B. B., 196.
 Robbins, E. T., 97.
 Robert, C., 322.
 Roberts, G. A., 77.
 Roberts, J., 770.
 Roberts, J. W., 154.
 Roberts, T. P., 642.
 Robertson, F. E., 391.
 Robertson, G., 639.
 Robertson, J. B., 66, 773.
 Robertson, M. E., 364.
 Robertson, R., 271.
 Robertson, R. A., 222.
 Robertson, R. D., 588.
 Robertson, T. B., 174, 408.
 Robertson, T. G. M., 570.
 Robertson, W. A. N., 471.
 Robin, L., 810.
 Robinson, G. H., 755.
 Robinson, J. H., 372.
 Robinson, L. E., 58.
 Robinson, L. G., 89.
 Robison, C. H., 597.
 Robison, C. J., 386.
 Robson, H., 264.
 Rock, J. F., 239, 643.
 Rockey, K. E., 753.
 Rodekohl, E. H., 97.
 Rodger, A., 443.
 Roe, 471.
 Røederer, M., 369.
 Roemer, H., 332.
 Roepke, W., 855.
 Roger, G. H., 174.
 Roger, H., 174.

- Rogers, A., 107.
 Rogers, C. A., 293.
 Rogers, C. G., 444.
 Rogers, C. S., 643.
 Rogers, D. M., 255.
 Rogers, J. S., 207.
 Rogers, L. A., 71.
 Rogers, M. S., 291.
 Rogers, S. S., 96, 540.
 Rohland, P., 817.
 Rohwer, S. A., 563.
 Rolet, A., 116.
 Rolf, A. F., 573.
 Rolfs, P. H., 396, 542, 847.
 Rolland, C., 377.
 Romberg, G. von, 212.
 Rommel, G. M., 896.
 Roncaglio, G., 382.
 Root, C. J., 121, 510.
 Rorer, J. B., 846, 851.
 Rose, D. A., 699.
 Rosé, E., 526.
 Rose, M. D. S., 868.
 Rose, R. C., 132.
 Rose, R. E., 271, 315, 320, 362, 766.
 Rose, W. C., 365.
 Rosenbaum, J., 650.
 Rosenblatt, M., 716.
 Rosenbloom, J., 66.
 Rosengren, L. R., 278.
 Rosenkranz, 105.
 Rosenthal, E., 377.
 Rosenthaler, L., 509.
 Ross, A. H. D., 343.
 Ross, B. B., 521.
 Ross, E. H., 656.
 Ross, J. F., 428.
 Ross, W. G., 16.
 Ross, W. H., 513.
 Rossi, R., 562.
 Rost, C. O., 794.
 Rost, E., 269.
 Roth, W. A., 107.
 Rothe, H. H., 838.
 Rothenfusser, S., 310, 808.
 Rothgeb, B. E., 738.
 Rottke, G., 715.
 Roubaud, E., 482.
 Rous, P., 385.
 Rousseaux, E., 60, 460, 822.
 Roux, W., 665.
 Rowe, P., 789.
 Rowe, R. W., 16.
 Rubner, M., 732.
 Ruddick, J. A., 673, 868.
 Rudnick, A. W., 699.
 Ruehle, G. L., 878.
 Ruijter de Wildt, J. C. de, 127.
 Rumbold, C., 754.
 Runciman, W., 200.
 Runner, G. A., 359.
 Ruot, 776.
 Ruot, M., 826.
 Rupp, P., 109.
 Rusche, A., 327.
 Rusk, E. W., 97.
 Rusk, H. M., 795.
 Russell, E. J., 122, 123, 169.
 Russell, H. M., 658.
 Rust, E. W., 359.
 Rutgers, A. A. L., 248.
 Ruth, W. E., 698, 802.
 Ružička, V., 159.
 Ryerson, K. A., 838.
 Rylance, J. W., 449.
 Ryneveld, A. van, 738.
 Ryves, R., 487.
 Ryziger, F., 102.
 Sablon, L. du, 524.
 Saborsky, P., 571.
 Saccá, R. A., 243, 250.
 Sackett, W. G., 819.
 Saftro, V. I., 41.
 Sagawe, B., 89.
 Sagnier, H., 101.
 St. Gatien, 874.
 St. John, B. H., 800.
 Salant, W., 265.
 Salin, H., 285.
 Salisbury, A. J., jr., 588.
 Salisbury, G. N., 812.
 Salmon, C., 233, 699.
 Salmon, D. E., 302, 385, 884.
 Salmon, E. S., 249, 846.
 Salter, C., 312.
 Salvadores, A. Z., 541.
 Samarani, F., 777.
 Sammis, J. L., 475.
 Sampson, A. W., 533, 543.
 Sanborn, C. E., 355, 853.
 Sanders, G. E., 58.
 Sanders, J. G., 55.
 Sanderson, H., 469.
 Sanderson, T., 661, 866.
 Sandles, A. P., 200, 868.
 Sandsten, E. P., 96.
 Sanfelici, R., 88.
 Sanford, S., 511.
 Sani, G., 340.
 Sannino, F. A., 838.
 Saporta, A. de, 414.
 Sar, M. E., 698.
 Sargent, C. S., 842.
 Sargent, P. D., 291.
 Sargent, W., 753.
 Sartory, A., 345, 547, 844.
 Sarvis, J. T., 741.
 Sasscer, E. R., 761.
 Satō, H., 665.
 Satsyproy, T., 851.
 Sauder, P. M., 683.
 Sauerbeck, A., 190.
 Sauerbeck, E., 174.
 Saunders, C. E., 222.
 Saunders, E. J., 486.
 Saunders, E. R., 341.
 Saunders, W. D., 567, 766.
 Sauret, L., 50.
 Sauton, B., 30, 381, 825.
 Savage, E. S., 98.
 Savastano, L., 552.
 Sawada, K., 450.
 Sawamura, S., 118.
 Sawyer, E. R., 739.
 Sawyer, W. A., 559.
 Sayre, C. B., 396.
 Scaffidi, V., 366.
 Scales, E., 698.
 Scales, F. M., 817.
 Schaeffer, G., 309, 767.
 Schaele, 468.
 Schafer, E. G., 498.
 Schaffnit, E., 47, 244, 445, 740.
 Schanck, F. R., 889.
 Schander, R., 44, 45.
 Schattke, A., 671.
 Scheibener, E., 155.
 Scherer, N. W., 544, 700.
 Scherer, R., 312.
 Scherffius, W. H., 430.
 Schermerhorn, L. G., 639.
 Scheunert, A., 671.
 Schilling, C., 380.
 Schindler, O., 436.
 Schippers, J. C., 809.
 Schirokich, P., 165.
 Schlecht, W. W., 85.
 Schleimer, A., 201.
 Schlumberger, O., 217.
 Schmahl, P. J. R., 676.
 Schmidt, A., 431.
 Schmidt, J., 587.
 Schmidt, R., 498.
 Schmitt, A. R., 510.
 Schmitt, F. M., 285.
 Schmitz, B., 409.
 Schmitz, N., 193.
 Schneider, E. E., 747.
 Schneider-Orelli, O., 858.
 Schneidewind, W., 870.
 Schnider, A., 89, 811.
 Schnürer, J., 677.
 Schoen, M., 803.
 Schoene, W. J., 253, 762.
 Schoenfeld, W. A., 675.
 Schoenmann, L., 17.
 Schoevers, T. A. C., 249.
 Scholl, A., 377.
 Scholl, E. E., 571.
 Schollander, E. G., 209, 211, 225,
 226, 237, 415, 424.
 Schoonover, W. R., 396.
 Schorr, R., 314.
 Schreiner, A., 66.
 Schreiner, O., 219.
 Schröder, J., 319, 823.
 Schroeder, E. C., 500, 778.
 Schroeder, F. C., 815.
 Schuberg, 760.
 Schulow, I., 423.
 Schultz, F. W., 365.
 Schulz, H., 837.
 Schulz, W., 586.
 Schulz, W. H., 69.
 Schulze, B., 418.
 Schulze, E. W., 135.
 Schumann, H., 571.
 Schuppli, P., 369.
 Schütz, 378.
 Schütz, W., 581.

- Schutze, 783.
 Schuyten, M. C., 364.
 Schwab, J. W., 698.
 Schwappach, 240, 747.
 Schwartz, M., 353, 550.
 Schweitzer, A. E., 767.
 Schwenk, E., 568.
 Scofield, C. S., 140, 226, 491.
 Scott, F., 644.
 Scott, H., 251.
 Scott, J. H., 721.
 Scott, J. M., 224, 272, 576.
 Scott, J. W., 482, 600, 699.
 Scott, P. R., 214.
 Seulier, A. J., 719.
 Scurti, F., 201.
 Sebelien, J., 24.
 Secrest, E., 746.
 Sedgwick, J. P., 365.
 Seeker, A. F., 799.
 Seelhorst, C. von, 214.
 Seemann, F., 319.
 Segerfelt, B., 504.
 Seibold, E., 888.
 Seiglinger, J., 497.
 Seki, T., 18.
 Selby, A. D., 436.
 Sellards, E. H., 25, 315, 387, 416.
 Semichon, L., 854.
 Semper, 746.
 Sénéchal, A., 202.
 Sengerken, H. von, 657.
 Senn, C. H., 464, 566.
 Sergeant, E., 482.
 Serpek, O., 319.
 Serres, J. R., 856.
 Seton, R. S., 145, 276.
 Settle, (Mrs.) T. G., 465.
 Settle, T. S., 599.
 Seulke, K. J., 399.
 Severin, H. C., 656.
 Severin, H. H. P., 54, 257, 656.
 Severini, G., 844, 845.
 Severson, B. O., 773.
 Seymour, G., 635, 855.
 Seymour, L. H., 396.
 Shannon, C. W., 441, 815.
 Shannon, F. L., 463.
 Shannon, J. L., 672.
 Shantz, H. L., 130, 825.
 Sharp, D., 157, 250, 251.
 Sharp, L. T., 300, 325.
 Sharp, W. N., 377.
 Sharples, A., 651.
 Shaw, A. B., 96.
 Shaw, C. F., 16.
 Shaw, F. J. F., 346.
 Shaw, G. W., 540.
 Shaw, J. K., 40, 435.
 Shaw, T. P., 372.
 Shaw, W. N., 120.
 Shear, C. L., 553, 753.
 Sheather, A. L., 481.
 Sheets, E. W., 600.
 Shelford, V. E., 456.
 Shelton, E. J., 773.
 Shepard, J. H., 635.
 Shepperd, J. H., 229.
 Sherff, E. E., 615.
 Sheridan, F. J., 690.
 Sherier, J. M., 510.
 Sherman, F., jr., 558, 758.
 Sherman, J. D., jr., 353.
 Sherman, W. A., 140.
 Sherrard, G., 228, 830.
 Shilston, A. W., 476.
 Shimooka, C., 188.
 Shipley, A. E., 250.
 Shmuk, A. A., 817.
 Shoemaker, S. W., 193.
 Sholl, L. H., 837.
 Shook, L. W., 370, 497.
 Short, A. K., 773.
 Shroff, K. D., 756.
 Shulov, I., 732.
 Shutt, F. T., 209, 210, 211, 222, 235, 270, 765.
 Sieber, N. O., 481.
 Siegfeld, M., 311.
 Siewert, A. von, 663.
 Silvestri, F., 250, 251.
 Silvestri, S., 659.
 Simkhovitch, V. G., 789.
 Simmermacher, 214.
 Simmonds, E., 42.
 Simmonds, G. J., 689.
 Simmons, R. C., 273.
 Simmons, R. E., 240.
 Simon, E., 250, 251.
 Simon, F., 828.
 Simon, G. W., 894.
 Simon, S. V., 240.
 Simpson, W. A., 473.
 Sinclair, J. S., 397.
 Singh, P., 719.
 Sinn, J. F., 833.
 Sipe, S. B., 695.
 Sirks, M. J., 659.
 Sirot, M., 60, 460.
 Sívén, V. O., 63.
 Skar, O., 206.
 Skilling, W. T., 598.
 Skinner, H., 559.
 Skinner, J. J., 25, 219.
 Skinner, R. P., 319.
 Slade, D. D., 794.
 Sladen, F. W. L., 860.
 Slate, W. L., jr., 195.
 Slaus-Kantschieder, J., 119.
 Sloan, D. K., 16.
 Sloum, F., 121.
 Smart, W. W., 830.
 Smedley, I., 508.
 Smith, A., 317.
 Smith, A. G., 233.
 Smith, C. O., 449, 650.
 Smith, C. P., 337.
 Smith, E. H., 96.
 Smith, F. B., 516.
 Smith, G., 575.
 Smith, G. A., 878.
 Smith, G. E. P., 484.
 Smith, G. I., 193.
 Smith, G. P. D., 46, 170.
 Smith, H. C., 16.
 Smith, H. D., 872.
 Smith, H. H., 840.
 Smith, H. L., 463, 566.
 Smith, I. A., 142.
 Smith, J. B., 353.
 Smith, J. W., 121, 722.
 Smith, L. E., 900.
 Smith, N. R., 817.
 Smith, O., 600.
 Smith, O. C., 718, 796.
 Smith, P. H., 876.
 Smith, P. S., 210.
 Smith, R. B., 471.
 Smith, R. I., 56.
 Smith, R. McN., 661.
 Smith, T., 302, 764.
 Smith, T. O., 769.
 Smith, V. C., 700.
 Smith, W. A., 266.
 Smith, W. B., 798.
 Smith, W. H., 791.
 Smith, W. V., 794.
 Smith, W. W., 689.
 Smits, M. B., 142.
 Snedden, D., 191, 791.
 Snell, K., 836.
 Snider, H. J., 396.
 Snider, L. C., 591.
 Snodgrass, M. D., 770.
 Snodgrass, W., 440.
 Snyder, W. F., 225, 546, 634.
 Sobotta, 835.
 Sobrinho, J. B., 833.
 Sohler, W. D., 291.
 Solanet, L. E., 561.
 Solereder, H., 51.
 Somes, M. P., 699.
 Sommerville, D., 802.
 Soper, G. A., 617.
 South, F. W., 347.
 Southwick, B. G., 697.
 Soutter, R. E., 244.
 Spann, 171, 369.
 Spann, W. M., 16.
 Spaulding, M. H., 651.
 Spaulding, P., 554.
 Spears, H. D., 270.
 Speiser, P., 250.
 Spence, E. R., 699.
 Spencer, A. P., 396, 833.
 Spencer, J. H., 812.
 Spencer, S., 371.
 Spieckermann, A., 151.
 Spillman, W. J., 68, 294, 532, 689, 896.
 Spinks, G. T., 844.
 Spragg, F. A., 535.
 Sprague, R. J., 197.
 Sprague, V. M., 362.
 Spring, F. G., 240.
 Spring, S. N., 546.
 Sprinkmeyer, H., 612.
 Squires, J. H., 182.
 Stackhouse, H. M., 731.
 Stacy, W. A., 633.
 Stähler, A., 822.
 Stamm, H. K., 811.
 Stanley, L., 465.
 Stapledon, R. G., 530.

- Stapp, G. M., 320.
 Starling, E. H., 767.
 Stebbing, T. R. R., 250.
 Stebler, F. G., 150.
 Stebut, A., 532.
 Steenbock, H., 65, 66.
 Steffen, A., 649.
 Steffenhagen, K., 382.
 Steffens, D. H., 580.
 Stegemann, L., 671.
 Steiner, C. D., 497.
 Stelzenmuller, G. V., 195.
 Stephani, W., 111.
 Stephens, J. M., 630, 696.
 Stephenson, J., 514.
 Stephenson, L. W., 722.
 Stepp, W., 365.
 Stevens, F. L., 21.
 Stevens, G. C., 511.
 Stevens, H. E., 242.
 Stevens, J. S., 121.
 Stevens, N. E., 553, 753.
 Stevenson, (Mrs.) L., 362.
 Stevenson, W. H., 97.
 Stewart, F. C., 249, 649.
 Stewart, J. D., 287.
 Stewart, J. G., 788.
 Stewart, J. P., 148, 437.
 Stewart, R., 18, 21, 211.
 Stewart, V. B., 348, 398, 551.
 Stewart, W. P., 812.
 Stiepel, C., 413.
 Stier, R., 783.
 Stift, A., 153, 246, 550.
 Stivers, E. D., 700.
 Stockberger, W. W., 13.
 Stockdale, F. A., 416, 417, 644.
 Stockhausen, von, 186.
 Stockman, S., 159.
 Stoddard, E. M., 753.
 Stoddart, E. T., 900.
 Stokes, E. E., 830, 833.
 Stoklasa, J., 130.
 Stoltzenberg, 614.
 Stone, G. E., 216, 741, 827.
 Stone, J. L., 196.
 Stone, W. E., 698.
 Stoneburn, F. H., 288.
 Stoneking, J. B., 398.
 Storm, A. V., 400.
 Störmer, K., 446, 447.
 Stover, M. E., 96.
 Stover, N. M., 588.
 Stoward, F., 628.
 Strahorn, A. T., 17.
 Stratton, (Mrs.) J. T., 465.
 Street, J. P., 660, 800.
 Strickland, C., 55.
 Strickland, E. H., 856.
 Strigel, A., 308.
 Strode, S. E., 200, 266.
 Strohmmer, F., 332.
 Strong, F., 698.
 Stroud, D., 465.
 Struthers, J., 729.
 Stuart, D., 699.
 Stuart, W., 194, 230, 739, 743.
 Studhalter, R. A., 754.
 Stumpf, J., 530.
 Stutzer, A., 129, 408, 572.
 Suchtelen, F. H. H., van, 203.
 Sudworth, G. B., 149, 543.
 Sullivan, M. X., 817.
 Summers, L. W., 370, 697.
 Surface, F. M., 195, 677, 779.
 Surface, H. A., 758.
 Surface, H. E., 119.
 Suter, P. H., 280.
 Sutherland, N. M., 684.
 Suzuki, U., 263.
 Svoboda, H., 728.
 Swaine, J. M., 558.
 Swanson, C. O., 823, 863.
 Swanson, F. A., 633.
 Sweeney, M. P., 506.
 Sweet, A. T., 17.
 Swellengrebel, N. H., 756.
 Swenk, M. H., 252.
 Swingle, L. D., 600, 756.
 Swingle, W. T., 424, 542, 839.
 Sydow, H., 844.
 Sykes, E. R., 250.
 Sylvester, R., 291.
 Symmonds, R. S., 16.
 Symons, T. B., 146, 353.
 Szász, A., 778.
 Tabor, G., 840.
 Tacke, 331.
 Tadokoro, T., 308, 803.
 Tait, C. E., 588.
 Takahashi, T., 565.
 Talanoff, V., 534, 535.
 Talbert, T. J., 699.
 Talbot, C., 291.
 Tallgren, H., 178.
 Tammes, T., 424.
 Tanquary, M. C., 699, 860.
 Tartar, H. V., 534.
 Tashiro, S., 466, 836.
 Tasset, J., 682.
 Taubenhaus, J. J., 195, 352, 450, 650.
 Taylor, A. A., 44.
 Taylor, A. E., 62, 365, 762.
 Taylor, F. W., 736, 741.
 Taylor, H. C., 675.
 Taylor, N. R., 121, 415, 510, 721, 812.
 Taylor, R. M., 220.
 Taylor, W. A., 436, 636.
 Taylor, W. J., 96.
 Taylor, W. P., 70.
 Teasley, (Mrs.) D. O., 574.
 Tebbutt, H., 357.
 Tedeschi, A., 57.
 Teichert, K., 376.
 Teichmann, E., 176.
 Tempamy, H. A., 42.
 Templeton, G. S., 697.
 Tenny, L. S., 98, 294, 894.
 Teppig, W., 385.
 Terry, B. T., 379.
 Teyssier, R., 312.
 Thackara, A. M., 70.
 Thalau, W., 521.
 Tharp, W. E., 16, 815.
 Thatcher, R. W., 42, 191, 833.
 Thayer, L. A., 777.
 Theiler, A., 476, 581, 584, 585.
 Theobald, F. V., 454, 476, 861.
 Thering, R., 856.
 Thickens, J. H., 614.
 Thiele, R., 751.
 Thieringer, H., 384.
 Thiessen, A. H., 510, 811.
 Thomae, C., 459, 461.
 Thomas, (Mrs.) H., 575.
 Thomas, K., 164.
 Thomas, M., 99.
 Thomas, M. C., 700.
 Thomas, P., 609.
 Thompson, A. R., 231.
 Thompson, C. Y., 633.
 Thompson, C. W., 489, 794, 875.
 Thompson, D. S., 472.
 Thompson, F., 40, 503, 711, 712.
 Thompson, G. E., 497.
 Thompson, H. C., 635.
 Thompson, J. I., 69, 573.
 Thompson, M. W., 182.
 Thompson, R. F. M., 573.
 Thomsen, A., 779.
 Thomsen, E., 663.
 Thomson, C. G., 582.
 Thomson, N., 733.
 Thöni, J., 376.
 Thornber, J. J., 440, 443.
 Thornber, W. S., 745.
 Thorne, C. E., 106, 746, 820.
 Thornton, E. W., 16, 467.
 Thouret, A., 849, 850.
 Thresh, J. C., 506.
 Thurgau, M., 209.
 Tidswell, F., 173, 676, 677, 756, 783.
 Tiebout, G. L., 338.
 Tiemann, D., 343.
 Tiemann, H., 673.
 Tiffany, R. K., 84.
 Tilley, G. S., 698.
 Tillman, O. I., 144.
 Timberlake, P. H., 654.
 Tireman, H., 239.
 Tisdale, C. W. W., 206.
 Tisdale, H. B., 697.
 Titus, E. G., 259.
 Titze, C., 381, 383.
 Todd, J. L., 585.
 Tölg, F., 760.
 Tollens, B., 715.
 Tolman, L. M., 263.
 Tolstaja, Z., 324.
 Tomhave, W. H., 789.
 Tomkins, D. A., 294.
 Tonduz, P., 810.
 Tonelli, A., 156.
 Tornquist, A., 593.
 Török, E., 558.
 Torrance, F., 482, 500.
 Tosatti, A., 838.
 Tóth, J., 810.
 Tohill, J. D., 358.
 Tottenham, W. F. L., 444.
 Totttingham, W. E., 23, 624.

- Tournois, J., 27.
 Tousley, E. M., 397, 894.
 Toussaint, 103.
 Tower, D. G., 459.
 Tower, W. S., 517.
 Townsend, C. H. T., 262, 356, 358, 654, 657, 658, 856.
 Trabucco, G., 240.
 Trabut, 117.
 Tracy, A. W., 500.
 Tracy, J. E. W., 743.
 Tracy, J. J., 741.
 Trägårdh, I., 759.
 Traum, J., 779.
 Trautschold, R., 292.
 Travelbee, H. C., 698.
 Traverso, G. B., 51.
 Treadwell, F. P., 506.
 Trelles, J. Barcia y, 491.
 Treuthardt, E. L. P., 799.
 Tribout, A., 582.
 Trichereau, A., 233.
 Trilling, M. B., 794.
 Tritschler, 319.
 Troili-Petersson, G., 580.
 Troop, J., 395.
 Trouette, G., 573.
 Troup, R. S., 443.
 Trow, A. H., 216.
 Trowbridge, P. F., 420.
 Truax, H. E., 649.
 True, A. C., 1, 101, 105, 698.
 True, G. H., 138.
 Trueman, J. M., 398.
 Trumbull, R. S., 398.
 Truog, E., 17.
 Tschermak, E. von, 433.
 Tubeuf, C. von, 243.
 Tucker, S. A., 24, 417.
 Tucker, W. M., 616.
 Tuckermann, R., 89.
 Tullio, P., 665.
 Tunnicliff, R., 778.
 Turner, D., 530.
 Turner, H. C., 544.
 Turner, J. D., 270, 800.
 Turner, J. P., 500.
 Turnor, C., 188.
 Turrentine, J. W., 214, 318, 517.
 Tushnov, M. P., 167.
 Tweedy, N., 568.
 Twort, C. C., 285.
 Twort, F. W., 81.
 Tzvetinovitche, A., 772.
 Ubbelohde, T. A., 173.
 Udall, D. H., 587.
 Udden, J. A., 617.
 Uhlenbröck, B., 479.
 Ulander, A., 138.
 Ulrich, C., 205.
 Uphof, J. C. T., 697.
 Upson, F. W., 397.
 Upson, W. L., 184.
 Upton, H. E., 574.
 Urbain, J. A., 421, 629.
 Urban, J., 430, 536, 832, 833.
 Urich, F. W., 353, 858.
 Vail, M. B., 792.
 Valle, R. S., 454.
 Valencien, C., 806.
 Valerio, B. G., 58.
 Vallardi, C., 175.
 Vallée, H., 884.
 Valletti, G., 380.
 Valmari, J., 108.
 Van Amstel, J. E., 714.
 Vanatta, E. E., 796.
 Vanatta, E. S., 17.
 Van Boskirk, J. R., 633.
 Van Dam, W., 504, 580.
 Vandekerkhove, E. M., 431.
 Van der Bruggen, 101.
 Van der Elst, P., 447.
 Van der Feen-Müller, E., 473.
 Vandevelde, A. J. J., 360, 608, 714, 864.
 Van Dine, D. L., 52, 353.
 Van Duyn, C., 17.
 Van Dyke, E. C., 96.
 Van Eck, J. J., 310.
 Van Es, L., 100.
 Van Fleet, W., 639.
 Van Giesen, I., 178.
 Van Godtsenhoven, 170.
 Van Hise, C. R., 188, 894.
 Van Laer, H., 505.
 Van Luijk, A., 151.
 Van Norman, H. E., 71.
 Van Reenen, R. J., 684.
 Van Rensselaer, M., 868, 898.
 Van Ryneveld, A., 738.
 Van Slyke, D. D., 108.
 Van Slyke, L. L., 9, 798, 800, 805.
 Van Suchtelen, F. H. H., 203.
 Varvaro, U., 528.
 Vassiliev, T., 244.
 Vaughan, R. E., 645.
 Vedder, E. B., 180.
 Veitch, F. P., 207, 796.
 Vejdovsky, F., 67.
 Ventre, J., 414.
 Vercier, J., 494.
 Verge, G., 155, 350.
 Vermilyea, N., 291.
 Vermorel, V., 451, 790, 850.
 Verne, C., 829.
 Verplanck, V. E., 840.
 Verschaffelt, E., 326.
 Versluys, J., 15.
 Verteuil, J. de, 746.
 Vidal, J. L., 849, 850.
 Viereck, H. L., 562, 563.
 Vieth, P., 876.
 Vigor, H. D., 876.
 Villar, S., 278.
 Villavecchia, V., 801.
 Vilmorin, M. de, 104, 217.
 Vinall, H. N., 141.
 Vincens, F., 552.
 Vinet, 655.
 Vinson, A. E., 415, 439.
 Vipond, H. J., 514, 516, 737.
 Vityn, A., 307.
 Voelcker, J. A., 520.
 Vogel, 515, 746.
 Voges, E., 131, 244, 445.
 Voittellier, 169.
 Völtz, 66.
 Völtz, W., 665.
 Voorhees, E. B., 517.
 Voorhees, J. F., 314, 616.
 Voorhees, J. H., 213, 536.
 Vosler, E. J., 454.
 Vriens, J. G. C., 815.
 Vrijburg, A., 882.
 Vuillemin, P., 174, 548, 649.
 Vuillet, A., 549, 558, 853.
 Vuyst, P. de, 2, 101, 898.
 Wade, E. M., 284.
 Waggaman, W. H., 25, 519.
 Wagner, G., 314.
 Wagner, J. B., 644.
 Wagner, P., 215, 410.
 Wagner, W., 176.
 Waite, R. H., 371.
 Wakeley, L. M., 396.
 Wakerley, F., 830.
 Wale, B. N., 671.
 Walker, E., 247, 497.
 Walker, F. P., 172.
 Walker, G. B., 35.
 Walker, H. B., 85, 497, 784.
 Walker, J., 476.
 Walker, L. S., 795, 820.
 Walker, N. D., 567.
 Walker-Tisdale, C. W., 206.
 Wallace, J. S., 364.
 Wallace, R., 369.
 Wallis, J. H., 866.
 Wallschlaeger, F. O., 440.
 Walsingham (Lord), 250.
 Walters, E. H., 202.
 Walton, W. R., 52.
 Walworth, E. H., 396.
 Warber, G. P., 489.
 Warburton, C., 653.
 Ward, A. R., 285.
 Ward, R., 416, 417.
 Ward, R. DeC., 842.
 Ward, S. H., 500.
 Wardall, R. A., 398.
 Ware, E. E., 488.
 Ware, L. S., 719.
 Waring, G. A., 15.
 Warner, A. J., 398.
 Warren, G. F., 213, 690.
 Warrington, W. B., 290.
 Warry, R. G., 57.
 Washburn, F. L., 653.
 Washburn, R. M., 741, 775.
 Waterhouse, C. O., 157.
 Waters, C. E., 488.
 Waters, H. J., 894.
 Waterstradt, F., 89.
 Watkins, O. S., 436.
 Watkins, W. I., 699.
 Watson, C., 464.
 Watson, E. B., 16.
 Watson, E. J., 638.
 Watson, E. M., 379.
 Watson, G. C., 573.
 Watson, J. R., 251, 354, 833.

- Watson, T. L., 513.
 Watt, J., 814.
 Watts, F., 745, 748.
 Wauters, P., 775.
 Wawilow, N., 831.
 Way, C., 500.
 Weaver, L., 341.
 Weaver, L. A., 670.
 Webb, C., 594.
 Webber, H. J., 97, 635.
 Weber, A., 382, 582.
 Weber, G. G. A., 316.
 Webster, C. A., 699.
 Webster, E. H., 894.
 Webster, F. M., 356, 857.
 Wedemann, 80.
 Wedensky, K. K., 381.
 Wehfarg, O., 337.
 Wehmer, C., 528, 852.
 Wehrwein, G. S., 675.
 Weibull, M., 119.
 Weichardt, W., 568.
 Weigert, J., 125.
 Weil, A., 881.
 Weinfurter, F., 477.
 Weinland, H. A., 257.
 Weinzierl, T. von, 119.
 Weir, J. R., 852.
 Weir, W. W., 623.
 Weise, J., 657.
 Weiser, I., 374.
 Weiser, S., 633, 570, 776.
 Weiss, H. B., 56.
 Weiss, J. J., 332.
 Weitzel, A., 62.
 Welch, H., 600.
 Welch, P. S., 159, 699.
 Weld, L. D. H., 794.
 Weldon, G. P., 96.
 Wellington, R., 41, 196.
 Wellman, C., 460, 865.
 Wellmann, O., 668.
 Wells, C. A., 697.
 Wells, D. W., 699.
 Wells, E. L., 812.
 Wells, H. G., 177.
 Wells, L., 476.
 Welsh, F. S., 16, 594.
 Welsh, L. A., 510.
 Welten, H., 526.
 Welton, F. A., 36, 432.
 Wendler, O., 309.
 Wentworth, E. N., 97, 470, 570.
 Wenz, A., 821.
 Werner, R., 476.
 Werth, E., 552.
 Wessels, P. H., 419.
 Wescott, W. W., 580.
 Wester, P. J., 350, 566, 642.
 Westervelt, J., 266.
 Westgate, J. M., 633.
 Westover, H. L., 17.
 Weyl, T., 801.
 Wheeler, G. C., 497.
 Wheeler, R., 767.
 Wheelock, R. S., 292.
 Wheelock, R. W., 396.
 Whetzel, H. H., 98, 650.
 Whinery, S., 387.
 Whipple, O. B., 41, 639.
 Whitby, G. S., 149.
 Whitecomb, W., 209, 211, 415.
 White, A. S., 70.
 White, E. A., 398.
 White, E. J., 673.
 White, G. C., 97, 397.
 White, G. F., 57.
 White, G. R., 500.
 White, H. J., 366.
 White, H. L., 799.
 White, O. E., 321.
 White, P. J., 32.
 White, T. H., 336, 339.
 White, W., 774.
 Whiting, A. L., 326.
 Whitlock, B. W., 600.
 Whitmarsh, R. D., 653.
 Whitney, B. B., 356.
 Whitney, F. L., 298.
 Whitney, M., 16.
 Whitson, A. R., 623.
 Whittier, A. C., 40, 503, 711.
 Whyte, G. H., 684.
 Wiancko, A. T., 395.
 Wibberley, T., 331.
 Wichmann, H. J., 799.
 Wicks, W. H., 540.
 Wickson, E. J., 435.
 Widtsoe, J. A., 18, 99.
 Wiedersheim, W., 144.
 Wiegand, K. M., 196.
 Wiegner, G., 211, 408.
 Wieler, A., 214.
 Wiens, P., 174.
 Wiesner, J. von, 30.
 Wig, R. J., 686.
 Wiggins, C. C., 699.
 Wiggans, E. R., 389.
 Wight, C. J., 96.
 Wilcox, E. M., 47, 48.
 Wilcox, E. V., 236, 270, 784.
 Wilder, H. J., 416.
 Wildt, J. C., de R. de, 127.
 Wile, I. S., 868.
 Wiley, G. M., 148, 395.
 Wiley, H. W., 800.
 Wiley, J. R., 700.
 Wiley (Mrs.), J. R., 675.
 Wiley, R. C., 823.
 Wilkin, F. A., 148.
 Wilkins, P. M., 239.
 Wilkinson, A. E., 395.
 Wilkinson, J. W., 196.
 Wilkinson, R., 198.
 Wilkinson, W. E., 16.
 Willaman, J. J., 794.
 Willard, J. T., 823.
 Willard, R. E., 620.
 Willcox, O. W., 162.
 Willey, F., 276.
 Williams, B., 900.
 Williams, C., 585.
 Williams, C. B., 31, 35, 797.
 Williams, C. G., 36, 398, 432.
 Williams, C. V., 97.
 Williams (Mrs.), G., 465.
 Williams, G. I., 794.
 Williams, J. J., 498.
 Williams, J. S., 596.
 Williams, K. I., 659.
 Williams, W. L., 500.
 Williamson, A. A., 574.
 Williamson, C. G., 736, 769, 785.
 Williamson, C. S., jr., 300.
 Williamson, J. T., 335, 336.
 Willier, J. G., 743.
 Willner, M., 142.
 Willson, C. A., 666, 667.
 Wilsdorf, 665.
 Wilsie, W. E., 255.
 Wilson, A., 795.
 Wilson, C. S., 41, 694.
 Wilson, C. W., 676.
 Wilson, D., 169.
 Wilson, F. H., 96.
 Wilson, F. W., 396, 467.
 Wilson, G. W., 49, 50.
 Wilson, H. F., 158, 300.
 Wilson, J., 68, 228, 375, 466.
 Wilson, James, 491, 493.
 Wilson, J. A., 182.
 Wilson, J. K., 279, 878.
 Wilson, J. M., 93.
 Wilson, J. W., 669.
 Wilson, L. P., 613.
 Wilson, M., 554.
 Wilson, P. St. J., 291.
 Wilson, R., 794.
 Wilson, R. M., 530.
 Wilson, W., 68.
 Wilson, W. H., 190.
 Wilson, W. L., 634.
 Wilson, W. M., 812.
 Wimmenauer, 747.
 Wimmer, G., 151, 332.
 Winans, W., 171.
 Winberg, H. L. O., 172.
 Wing, H. H., 578.
 Wing, L. W., 578.
 Winge, Ö., 345.
 Winkel, A. J., 178.
 Winkler, C. H., 92.
 Winkler, W., 390.
 Winship, E., 293.
 Winslow, C. E. A., 814.
 Winslow, R. M., 639, 745.
 Winston, J. R., 300, 645, 646.
 Winter, O. B., 397, 800.
 Winter, W. R., 656.
 Wise, K. S., 16.
 Withers, W. A., 21, 76, 477.
 Withycombe, J., 300.
 Witte, H., 139, 612.
 Wodsedalek, J. E., 55, 794.
 Wohlgemuth, J., 609.
 Wohltmann, F., 727.
 Woker, G., 504.
 Wolcott, G. E., 375.
 Wolf, F. A., 552, 849.
 Wölfel, K., 284.
 Wolfer, A., 721.
 Wolf, G., 166.
 Wolff, J., 202.
 Wolff, S., 122.

- Wolfsgruber, R., 175.
 Woll, F. W., 367, 374, 420, 700.
 Wollenweber, H. W., 243, 444, 647.
 Wood, F. W., 285.
 Wood, H. P., 861.
 Wood, P. O., 16, 17.
 Wood, T. B., 361, 404.
 Woodbridge, T. R., 339.
 Woodburn, J. L. F., 656.
 Woodbury, C. G., 41, 395.
 Woodhouse, E. J., 759.
 Woodhull, A. A., 567.
 Woodruff, G., 692.
 Woods, A. F., 97.
 Woods, C. D., 129, 141, 468.
 Woodward, B. T., 499.
 Woodward, E. G., 795.
 Woodward, G. C., 673.
 Woodward, J., 396.
 Woodward, S. M., 487.
 Woodward, T. E., 869.
 Woodward, W., 465.
 Woodworth, C. W., 158, 558, 852.
 Woolley, V. J., 662.
 Woolman, H., 399.
 Wooton, E. O., 842.
 Work, P., 41.
 Works, G. A., 794.
 Worsham, E. L., 557.
 Worst, J. H., 700.
 Wortman, T. B., 196.
 Wright, C. W. B., 249.
 Wright, J. H., 803.
 Wright, L. L., 192.
 Wright, T. R. H., 497.
 Wright, W. D., 761.
 Wright, W. J., 40.
 Wright, W. P., 840.
 Wulff, F., 281.
 Wundsch, 784.
 Wyatt, B. I., 465.
 Wygodzinski, W., 391.
 Wyncken, F. A., 408.
 Wyschelessky, S., 583, 882.
 Wyt, R. B., 266.
 Yakimoff, N. K., 479, 484.
 Yakimoff, W. L., 479, 484.
 Yamamoto, T., 565.
 Yapp, W. W., 396.
 Yates, A. G., 677.
 Yeary, W. B., 894.
 Yeaton, G. A., 145.
 Yoakum, B. F., 894.
 Yocom, H. B., 699.
 Yoder, P. A., 835.
 Yoshimura, K., 863.
 Yothers, W. W., 53, 354.
 Young, F. C., 487.
 Young, J. L., 197.
 Young, J. M., 291.
 Young, R. A., 336, 361.
 Young, R. F., 722.
 Zabiello, 2.
 Zacharewicz, E., 839, 849.
 Zacher, F., 53.
 Zade, 144.
 Zade, A., 337.
 Zaitschek, A., 533, 774.
 Zaleski, E., 233.
 Zander, E., 57.
 Zebrowski, E. von, 663.
 Zederbauer, E., 441, 442.
 Zeederberg, W. R., 516.
 Zeller, 80, 385.
 Zellner, J., 323.
 Zerban, F. W., 17, 513.
 Zetek, J., 656.
 Ziegler, S., 233.
 Zietzschmann, O., 581.
 Zilva, S., 572.
 Zimmer, J. F., 200.
 Zimmer, J. T., 795.
 Zipperer, P., 312.
 Zolla, D., 594.
 Zon, R., 642.
 Zubrzycki, J. von, 175.
 Zumpe, A., 886.
 Zuntz, N., 165.
 Zwaenepoel, 771.
 Zwick, 80, 282, 385.

INDEX OF SUBJECTS.

NOTE.—The abbreviations "Ala.College," "Conn.State," "Mass." etc., after entries refer to the publications of the respective experiment stations; "Alaska," "Guam," "Hawaii," and "P.R." to those of the experiment stations in Alaska, Guam, Hawaii, and Porto Rico; "Can." to those of the experiment stations in Canada; and "U.S.D.A." to those of this department.

	Page.		Page.
Abacá fiber, strength of, U.S.D.A.	313	<i>Adoretus</i> spp., notes	858
Abattoirs. (See Slaughterhouses.)		<i>Adoxus obscurus</i> , new host plant of.	657
<i>Abies balsamea</i> as a host of fern rusts	645	Adrenal functioning, dependence on pituitary secretion	882
Abor tea, notes	463	Adrenalin, determination in blood	408
Abortin, diagnostic value	500	Adsorption, use in biochemical analysis	408
Mich	81	Æcidium, index of species	749
Abortion—		<i>Aedes calopus</i> , notes, U.S.D.A.	656
bacillus in milk	500	(<i>Stegomyia fasciata</i>), studies, Hawaii	252
U.S.D.A.	778	<i>scutellaris</i> , studies, Hawaii	252
inoculation of cattle with	779	<i>Aenoplegimorpha phytonomi</i> n. sp., description	563
investigations	80	Afforestation. (See Forestation.)	
contagious, and sterility in cows, Cal.	81	African coast fever, immunization	284, 476
Mich	80	transmission by ticks	584
in cattle	305, 677	Agalactia, contagious, in sheep and goats	179
diagnosis	586, 779	Agar-agar, ash analyses, Ohio	861
studies	80, 500	<i>Agati grandiflora</i> , notes, P. R.	652
U.S.D.A.	778	Agave anthracnose, notes	346
treatment, U.S.D.A.	696	<i>Agave</i> spp. fibers, strength of, U.S.D.A.	313
investigations	779	Agglutination test, diagnostic value for contagious abortion in cows	586
epizootic, in cattle, studies	481	Agrarian matters, treatise	391
mares	281	<i>Agria affinis</i> , studies	760
<i>Acacia mollissima</i> , sap ascent in	524	Agricultural—	
<i>Acaulona peruviana</i> n. sp., notes	358	activities of Jews in America	89
<i>Acer pseudoplatanus</i> , variations in salt content	28	chemical laboratory at Udine, Italy, report	119
Acetamid as a source of ammonia, Iowa	723	chemistry. (See Chemistry.)	
Acetic acid, detection in ethyl alcohol	312	clubs for boys and girls	394, 395
Acid amids as sources of ammonia in soils, Iowa	723	in New England	695
excretion, studies	62	colleges, courses in	393
phosphate. (See Superphosphate.)		genetics in	769
Acids, amino, absorption by the body	567	in United States, U.S.D.A.	897
as sources of ammonia in soils, Iowa	723	(See also Alabama, Arizona, etc.)	
behavior in soils	124	conditions in Denmark	295
determination in plants	411	the French Alps	190
effect on residual nitrogen in blood	768	contests	93
effect on <i>Aspergillus niger</i>	734	U.S.D.A.	299
concrete	184	cooperation, advantages	894
denaturation rate of proteins	502	bibliography	89
fatty, determination	309	in Argentina	895
of butter	508	Europe	691
rôle in germination of seeds	26	Holland	693
Acorns, storage in winter	343	Minnesota	392
<i>Acrocercops cramerella</i> , notes	855	New Jersey	392
Actinomycetes in soils	222	New York	692
Actinomyces in cattle	886	notes, Mont.	692
<i>Actinonema roseæ</i> , notes, Ala. College	552	papers on	595
Adams County, Miss., soil survey, U. S. D. A.	16	treatise	89, 188, 294, 595
<i>Adelencyrtus odonaspidis</i> n. sp., notes, Hawaii.	253	cooperative associations, law in Indiana	294
Adenin, isolation from molasses	614	course for high schools	91
Adjab fat, detection	613		

Agricultural—Continued.	Page.	Agricultural—Continued.	Page.
course for rural schools	192	instructors, geological course for	495
credit, benefits of	91	insurance, cooperative, U.S.D.A.	790
in Denmark	295	labor, distribution, Mo.	490
Europe	90, 294, 691, 895	in Australia	295, 393
Japan	188	notes	634
North Dakota	691	organization in Germany	392
Norway	789	laborers in England and Wales	189
Russia	188	wages of in England	596
United States	294,	laws in New York	897
392, 393, 491, 789, 894		machinery, advantages and disadvan-	
Wurttemberg	393	tages	89
notes, U.S.D.A.	491	care	595
papers on	894	and use	892
demonstration, editorial on	701	for moor plantations	488
economics. (<i>See</i> Rural economics.)		safety devices for	788
education—		speed indicators for	389
general and vocational, notes	191	meteorology. (<i>See</i> Meteorology.)	
government aid to in England and		organizations in Bavaria	294
Wales	191	United States	693
in Brazil	100	outlook, U.S.D.A.	896
Denmark	895	pamphlets, catalogue	93
England and Wales	394, 897	phosphate. (<i>See</i> Phosphate, insoluble.)	
Lancaster County, England	494	possibilities in United States and western	
Massachusetts	596	Canada, handbook	596
New York	791	products—	
Prussia	297	analyses	119
Sao Paulo	191	commerce in, treatise	293
Scandinavia	897	distribution	188, 894
Scotland	494	foreign trade in, U.S.D.A.	493
South Australia	295	laws affecting price	162
Trinidad	92	marketing	294, 595, 894
United States	494	Alaska	790
New York State advisory board	99	prices, U.S.D.A.	493
notes	103	in Australia	393
progress in, U.S.D.A.	897	transportation in various countries ..	789
(<i>See also</i> Agricultural instruction.)		research, essentials of	406, 702
engineers, conventional designs for	186	in England and Wales	897
handbook for	484	Scotland	494
experiment, editorial on	701	schools, aim of	791
stations. (<i>See</i> Experiment		in Norway	597
stations.)		science, college degrees of men engaged	
extension work—		in	191
in high schools	298	progress in	404
rural schools	899	small holdings, economy of	188
United States	494	in Denmark	895
U.S.D.A.	898	societies in Germany	392
instruction, outline	599	station at Cawnpore, report	138
(<i>See also</i> Agricultural colleges.)		statistics in Belgium	393
high schools, course of study for	791	France	89
implements, safety devices for	788	Porto Rico	189
institute at Alnarp	172	Scotland	493
instruction—		South Africa	897
for teachers	297	South Australia	295
young girls	695	United Kingdom	596
in elementary schools	91, 99, 394	United States	88
France	92	Victoria	896
Grenada	199	tenancy in central Europe	895
Hamilton County, Indiana	394	Agriculture—	
high schools	597, 897	and meteorology, paper on	120
U.S.D.A.	494	as affected by climate	811
Ireland	494	at National Education Association	399
Netherlands	898	bibliography	598
New Mexico	92	colloid chemistry in	408
Posen	92	courses in	92, 93, 693, 694, 791
rural schools	92, 695	Department of. (<i>See</i> United States De-	
secondary schools	99, 399	partment of Agriculture.)	
Spain	199	elementary, laboratory manual	93
West Virginia	92		

Agriculture—Continued.		Page.	<i>Aleyrodes citri</i> . (See White fly.)		Page.
elementary, text-book	193,298		<i>howardii</i> , studies, Fla.....		251
home exercises in.....	598		Aleyrodidæ, classification, U.S.D.A.....		54
importance and progress of.....	896		Alfalfa—		
in Alaska, Alaska.....	791		Arabian, notes, U.S.D.A.....		33
country life education.....	92		as a sand binder.....		427
Denmark.....	693		chopped, analyses, R. I.....		570
Germany.....	190,896		cooperative experiments, S. Dak.....		331
Japan.....	729		culture.....		633
Latin America.....	198		Cal.....		32
Northwestern States.....	594		experiments.....		631
Norway.....	897		Alaska.....		735
Southern States, progress and possibi-			Miss.....		736
ties.....	189		N. Dak.....		226
tropical America.....	896		N. H.....		736
international congress of.....	101		Nebr.....		225
institute of.....	1		in Porto Rico, P. R.....		631
postal savings funds for.....	895		on Yuma reclamation project,		
reading course in.....	598		U.S.D.A.....		226
relation to phenology and climatology.....	15		cutworms affecting, Nev.....		158
role of infinitely small amounts of chemi-			diseases, notes.....		243
cals in.....	129		dodder, remedies.....		561
text-book.....	93		effect on nitrification in soils.....		317
theories of Karl Marx.....	491		soil fertility.....		633
training schools in.....	199		moisture.....		634
treatise.....	594		yield of sugar beets, U.S.D.A.....		137
use of explosives in.....	183		feeds, analyses.....		467
<i>Agriotes lineatus</i> , notes.....	858		fertilizer experiments.....		737
<i>mancus</i> , notes, Me.....	252		for sheep.....		572
<i>Agromyza parvicornis</i> , studies, Ohio.....	257		germination as affected by fertilizers.....		327
<i>phaseoli</i> , notes.....	657		green, analyses.....		467
<i>pusilla</i> , studies and bibliography,			growth as affected by fertilizer salts.....		329
U.S.D.A.....	857		hay, analyses, Wyo.....		370
<i>schineri</i> , notes.....	159		ash analyses, Ohio.....		861
<i>simplex</i> . (See Asparagus miner.)			composition as affected by irrigation		139
spp., parasites of.....	359		for calves, Ill.....		771
<i>Agromyzinae</i> , synopsis.....	657		horses, Wyo.....		370
<i>Agropyron repens</i> , monograph.....	141		lambs, Can.....		272
spp., identification.....	741		Colo.....		871
<i>Agrostis alba</i> , analyses, Can.....	270		Idaho.....		870
<i>Agropyus fuscipes</i> , notes.....	858		handling.....		633
Air, humidity in mines, U.S.D.A.....	121		v. cowpea hay for dairy cows, Okla.....		876
methods of analysis.....	412		inoculation experiments, Nebr.....		332
pollution in dairy barns.....	474		irrigation experiments.....		139
(See also Atmosphere.)			N. Dak.....		226
<i>Alabama argillacea</i> , outbreak in Peru.....	356		Nev.....		138
Alabama College, notes.....	195,300,497,697		U.S.D.A.....		32
Station, notes.....	195,497,697		leaf hopper, notes.....		252
Alanin as a source of ammonia, Iowa.....	723		meal, analyses.....		367,467
Alaska Stations, report.....	793		Ky.....		270
Albumin, egg, denaturation rate in alkali.....	501		N. J.....		666
heat coagulation and solution.....	715		R. I.....		570
Alcohol—			Vt.....		769
denatured, as a decarbonizer and engine			Wis.....		367
cleanser.....	787		nitrogen and mineral constituents, Ohio.....		32
determination in presence of ketones.....	716		nurse crop for, N.Dak.....		226,425
industry in Germany.....	209		sclerotia disease affecting.....		845
Philippines.....	118		seed, germination and purity tests, Vt.....		741
manufacture from nipa palm.....	414		energy of.....		538
physiological value.....	665		yields, U.S.D.A.....		330
production by yeast, treatise.....	714		seedling experiments, Can.....		224
value in the diet.....	664		U.S.D.A.....		32,330,531
Aldehyde, detection in ethyl alcohol.....	312		serpentine leaf miner affecting, U.S.D.A.....		857
Alder flea beetle, notes, Can.....	761		thrips affecting.....		252
Me.....	252		transplanting, S.Dak.....		331
<i>Alectra arachidis</i> , notes.....	347		v. clover in the rotation.....		634
<i>Aleurites triloba</i> nuts, analyses, N. Dak.....	811		varieties.....		139,830

Alfalfa—Continued.	Page.	Ammonia—Continued.	Page.
varieties, Ariz.....	426	crude, studies.....	127
Can.....	222	determination.....	609
U.S.D.A.....	137	in foods.....	809
water requirements, U.S.D.A.....	826	soils.....	797
weevil, remedies, Utah.....	259	effect on peroxidase.....	202
yields, Mont.....	631	electrotechnical production.....	24
Alfalaria seed, collection and sowing, U.S.D.A.....	533	manufacture from the air.....	822
Algae, red, diastase in.....	220	nitric acid from.....	517
Algin, description.....	566	sources of in soils, Iowa.....	723
Alkali, effect on denaturation of proteins.....	501	synthetic, manufacture, progress in.....	730
peroxidase.....	202	preparation.....	127
protection of concrete structures from.....	386	utilization in protein metabolism.....	365
salts, effect on concrete.....	686	Ammonification—	
in soils of India.....	514	as affected by soil temperatures.....	317
studies, U.S.D.A.....	137	in Nebraska soils.....	734
soils or lands. (See Soils, alkali.)		soils, studies, N.C.....	21
tolerance of wheat seedlings, studies..	322	Ammonium—	
Alkaloids, detection.....	408	chlorid, effect on germination of seeds... 328	
effect on healthy cattle.....	476	citrate solutions, neutral, preparation.. 203,718	
plant, treatise.....	503	nitrate, fertilizing value.....	423
Alligator pears. (See Avocados.)		for mangels.....	830
<i>Allium vineale</i> , eradication.....	433	manufacture, progress in.....	730
<i>Allorhina mutabilis</i> , notes, Ariz.....	453	permutite, fertilizing value.....	127
Almond and peach graft hybrid, description..	838	phosphate, effect on germination of seeds. 328	
ground, description.....	59	salts, utilization by plants.....	133
Almonds, destruction by birds.....	51	sulphate. (See Sulphate of ammonia.)	
Java, as a food for infants.....	566	sulphite, fertilizing value.....	521
Alnarp Agricultural and Dairy Institute.....	172	Amorphophallus tubers, analyses.....	463
<i>Alopecurus pubescens</i> , culture in New Zealand.....	428	Amygdalase, notes.....	509
Altai, hybridization experiments.....	171	Amygdalin from various sources, tests.....	509
<i>Alternaria</i> —		Amyloids, variations of in leaves.....	827
<i>citri</i> , notes.....	248	<i>Anacardium occidentale</i> , notes.....	746
<i>panax</i> , notes.....	549	<i>Anagrus spiritus</i> , parasitic on San José scale.. 758	
<i>solani</i> , description and treatment, Fla... 847		<i>Anaphes</i> sp., parasitic on San José scale.. 758	
notes.....	646	Anaphylatoxin, effect on heat production in rabbits.....	479
spp., relation to citrus gummosis, Fla.... 247		Anaplasmosis, canine, notes.....	385
<i>violæ</i> , studies.....	753	in cattle in South America.....	886
Alumina and carbon, fixation of nitrogen by. 417		transmission by ticks.....	584
from feldspar.....	518	Anaplasma in erythrocytes of mammals.....	478
relation to nitrogen fixation.....	24	<i>Anastrepha fraterculus</i> (?), notes, P.R.....	652
Aluminum—		<i>peruviana</i> n.sp., notes.....	657
cooking vessels, tests.....	362,363	Anchovy butter adulteration, detection.....	361
determination in foods.....	809	Anemia, relation to lime deficiency, P.R.... 622	
plants.....	797	Anesthesia, paper on.....	500
nitrid, formation.....	822	Anesthetics. (See Ether and Chloroform.)	
manufacture and use.....	319	Angeworms, relation to soil bacteria.....	316
progress in.....	730	Animal—	
Serpek process.....	127	and plant tumors, comparison.....	548
oxid, effect on germination of seeds.....	528	body, regulation of neutrality in.....	62
Alunite, fertilizing value, U.S.D.A.....	25	breeding in India.....	676
American—		reversion in.....	570
Association of Farmers' Institute Workers, U.S.D.A.....	792	use of averages and relative figures in.....	368
Meat Packers' Association, report.....	770	diseases, contagious, in India.....	676
Road Congress, proceedings.....	291	control by treatment of grass lands.....	676
Veterinary Medical Association.... 197,301,498		diagnosis.....	477
Amids, acid, as sources of ammonia in soils, Iowa.....	723	prevalence in Denmark.....	377
synthesis by plants.....	133	relation to diet deficiency.....	66
Amino acids. (See Acids, amino.)		serodiagnosis.....	377
groups, aliphatic, determination... 108,408		treatise.....	880
Ammonia—		(See also specific diseases.)	
compounds, detection in ethyl alcohol... 312		husbandry, review of literature.....	271
determination in meat and fish products.....	798	text-book.....	598
		industry in Russia.....	570

Animal—Continued.	Page.		Page.
nutrition, phosphorus compounds in.....	369	Antibodies, detection.....	881, 882
problems in.....	169	in Dorset-Niles serum, Mich.....	82
oil, detection in ethyl alcohol.....	312	tubercular, notes.....	583
physiology, progress in.....	408	Antibody formation during preparation of	
production, text-book.....	570	serums.....	581
products, ash analyses, Ohio.....	861	Antiersipelas serum, preparation.....	378
statistics in Germany.....	70	Antiformin, diagnostic value.....	285
tissues, water content.....	767	Antigens, detection.....	881, 882
Animals—		tubercular, notes.....	583
descent of.....	68	Antihog cholera serum—	
domestic, danger of contaminated streams		distribution, Cal.....	888
to.....	880	production and use.....	888
heredity in.....	665	use.....	482
insects affecting, Can.....	252	Antipyrin, determination.....	800
of ancient Crete.....	169	Antirinderpest serum, tests.....	285
experimental rooms for.....	167	Antiseptics, action of.....	802
injurious, in Ireland.....	555	Ants injurious to coffee, P. R.....	652
to plants.....	547, 645	okra.....	653
tobacco.....	551	Apache National Forest, composite type on,	
lime requirements.....	65	U.S.D.A.....	43
lower, fertilization in.....	167	<i>Apanteles impurus</i> , notes.....	562
metabolism experiments.....	62	n. spp., descriptions.....	563
pigmentation in.....	466	sp. notes, Me.....	256
ratio of heat production to body weight..	569	<i>Apanteles kotinskyi</i> n. sp., notes, Hawaii..	253
seed destroying, combating, U.S.D.A.....	545	<i>Aphanomyces laevis</i> , notes.....	647
structure terminology of.....	665	<i>Aphelinus fuscipennis</i> , parasitic on San José	
tuberculous, rôle in infection of man.....	382	scale.....	758
utilization of mineral phosphates by.....	870	Aphids, notes.....	854
warm-blooded, calorimetric experiments on		Me.....	654
(See also Live stock, Cattle, Sheep, etc.)	569	<i>Aphiochaeta juli</i> , habits.....	457
<i>Anisandrus dispar</i> , investigations.....	858	<i>Aphis abietina</i> , outbreak in England and Ire-	
<i>Anisota senatoria</i> , notes, Md.....	353	land.....	757
<i>Anogeissus latifolia</i> , notes.....	443	<i>brevisiphona</i> n. sp., notes.....	454
<i>Anomis</i> n. spp., descriptions.....	456	<i>forbesi</i> , notes.....	653
<i>Anona</i> spp., possibilities of.....	642	<i>gossypii</i> . (See Cotton aphid or Melon	
Anopheles, malaria transmitting, notes.....	856	aphis.)	
<i>Anopheles quadrimaculatus</i> , entangling in		<i>maidi-radicis</i> . (See Corn root aphid.)	
spider webs.....	861	<i>maidis</i> , notes.....	252
Ant, Argentine, in California.....	654	<i>pomi-mali</i> . (See Apple aphid.)	
studies and bibliography,		spp., notes.....	454
U.S.D.A.....	563	Aphis, woolly, notes, Cal.....	558
common house, trail formation and ori-		Aphthous fever. (See Foot-and-mouth dis-	
entation.....	860	ease.)	
corn field, life history.....	860	<i>Aphyces</i> spp., notes.....	654
harvester, notes, Ariz.....	453	Apiculture, Mendelian methods in.....	860
Anthocyanin formation, relation to mitochon-		notes, Can.....	252
dria.....	827	(See also Bees.)	
pigments, formation in plants. 219,	421	<i>Apis mellifera</i> . (See Bees.)	
<i>Anthonomus grandis</i> . (See Cotton-boll weevil.)		Apple—	
<i>pomorum</i> , parasites of.....	562	aphids, remedies, N.Y.State.....	356
<i>rubi</i> , notes.....	658	aphid, notes, Md.....	353
<i>vestitus</i> , notes.....	562, 658	Mont.....	652
<i>Anthoxanthum odoratum</i> , germination experi-		woolly, notes.....	353, 654
ments.....	143	Ariz.....	453
Anthrax bacillus, natural immunity against.		Md.....	353
diagnosis.....	281, 378, 778	bitter pit, investigations.....	246
infection in sheep.....	582	rot, enzym activity in, Va.....	648
intestinal, in swine.....	888	canker, description and treatment.....	752
studies.....	478	diseases, notes.....	353
symptomatic. (See Blackleg.)		Can.....	242
transmission by stable flies.....	761	Md.....	146
treatment.....	679	prevalence in Iowa.....	445
<i>Anthus rubescens</i> , destruction of grain aphids		studies, Ark.....	649
by, U.S.D.A.....	453	ermine moth, notes.....	252
Antianthrax serum, preparation.....	378	fire blight, notes, Wash.....	848
		studies, N.Y.Cornell.....	348
		fruit buds, formation.....	437

Apple—Continued.	Page.	Apples—Continued.	Page.
fruit buds, winter injuries.....	41	spraying.....	436
juice, notes.....	116	storage in peat dust.....	641
studies, Del.....	711	storing.....	40
leaf aphid, green, notes.....	353	summer spraying, Md.....	146
frog eye spot, studies, Va.....	648	thinning, Utah.....	541
hopper, notes.....	354	varieties, Can.....	235
miner, unspotted tentiform, notes.....	655	for Australia.....	340
scorch, notes.....	845	Ohio.....	395
spot, notes, N.H.....	748	Pacific Northwest.....	745
leaves as affected by cedar rust fungus,		resistant to diseases.....	246
Va.....	647, 648	susceptible to diseases.....	436
infection by cedar rust, N.C.....	49	Ohio.....	436
<i>Gymnosporangium</i>		Apricot fire blight, notes, Wash.....	848
<i>macrosporus</i>	647	pollen, frost resistance of.....	437
limb diseases, notes and treatment, N.C.	49	Apricots—	
maggot, biology and remedies, N.Y.Cornell.....	560	composition as affected by irrigation,	
orchards, care and management.....	353	Idaho.....	236
Ohio.....	42	dried, preparation and use, U.S.D.A.....	462
fertilizers for.....	148	growth as affected by meteorology.....	510
pruning, Utah.....	148	Arachnids injurious to orch.....	853
pollen, vitality.....	326	Arbor day for roads.....	695
rough bark, studies, U.S.D.A.....	154	Arboriculture, ornamental, notes and bibli-	
sawfly, notes.....	861	ography.....	148
scab, notes.....	247	<i>Archytas piliiventris</i> , notes.....	356
treatment, Me.....	146	<i>Arctia caja</i> , bacillary septicemia of.....	855
skins, ether extract of.....	461	<i>Ardisia crispata</i> , symbiosis with bacteria.....	30
isolation of fat from.....	459	<i>Argas miniatus</i> , notes and remedies, U.S.D.A.	58
sooty blotch, notes.....	154	<i>persicus</i> , anatomy.....	58
tent caterpillar, life history and remedies,		spp., notes.....	563
Conn. State.....	655	Arizona Station, financial statement.....	496
tree anthracnose, studies, Oreg.....	153	notes.....	396, 697
borers, notes.....	353	report of director.....	496
cankers, notes, Ohio.....	793	University, notes.....	396, 697
water core, studies.....	848	Arkansas Station, notes.....	300, 396, 497, 697
weevil, parasites of.....	562	University, notes.....	300, 396, 497, 697
Apples—		Armadillo, nine-banded, biology and habits.....	755
analysis of quality in.....	40	<i>Armillaria mellea</i> , notes.....	851
ash analyses, Ohio.....	861	Army rations, description and preparation.....	661
composition as affected by irrigation,		food value.....	567
Idaho.....	237	worm, fall, life history and remedies.....	655
cost of production.....	439	notes.....	356
culture.....	745	Md.....	353
experiments.....	42	P.R.....	53, 652
in Alaska, Alaska.....	742	U.S.D.A.....	53
the Ozarks, U.S.D.A.....	237	notes.....	252
disease resistance in, N.Y.State.....	41	Arrowroot, examination.....	361
dried, preparation and use, U.S.D.A.....	462	Arsenic content of leaves.....	628
fertilizer experiments.....	539	determination in baking powder.....	799
Pa.....	437	lead arsenate.....	797
fibro-vascular system.....	542	occurrence in baking powders, N.Dak.....	866
frost injuries.....	49, 547	use against foot diseases in horses.....	783
gross morphology, Oreg.....	541	surra.....	883
growth as affected by meteorology.....	510	Arsenical dips—	
soils.....	416	preparation and use, Ala.College.....	585
insects affecting.....	353	tick-killing properties.....	886
Jonathan spot rot affecting.....	847, 848	use against cattle ticks, U.S.D.A.....	287
marketing cooperatively.....	392	Arsenicals, substitutes for.....	758
new, descriptions, N.Y.State.....	838	Artemisia, water requirements, U.S.D.A.....	826
U.S.D.A.....	436	Artesian wells, increasing yield of, Ariz.....	494
of New York, N.Y.State.....	41	<i>Arvicola agrestis</i> . (See <i>Microtus agrestis</i> .)	
orange rust of, Conn.State.....	547	<i>Ascochyta citrullina</i> , inoculation experiments.....	847
packing.....	838	<i>pisi</i> , ascigerous stage of.....	645
preservation.....	312	notes.....	447
reducing and nonreducing sugars in.....	503	Ash, determination in foodstuffs.....	366, 809
respiration in gases.....	135	Ashes, volcanic, effect on soils, Alaska.....	726
seedless, tests, N.Y.State.....	42	Asiatic lady beetle, notes.....	258
silver leaf disease affecting.....	845	Asparagin as a source of ammonia, Iowa.....	723

	Page.
Asparagin, effect on legume bacteria	733
Asparagus—	
analyses and food value	461
beetle, 12-spotted, studies and bibliog- raphy, N.Y.Cornell	556
marketing cooperatively	392
miner, studies and bibliography, N.Y. Cornell	555
soup, notes	461
Aspartic acid as a source of ammonia, Iowa ..	723
Aspergillosis in canaries	84
<i>Aspergillus</i> —	
<i>fumigatus</i> , notes	84
spore formation in	30
<i>niger</i> as affected by acids and salts	734
silver salts	554
formation of tannase in	132
growth as affected by manganese ..	219
relation to iodine compounds	133
utilization of copper by	628
glucinium by	28
uranium nitrate by	422
<i>oryzae</i> in tamari-koji	161
utilization of rice proteins by	565
varieties of	565
<i>sartoryi</i> n. sp., studies	844
spp. as affected by phosphorus and mag- nesium	825
Asphalts, rock, of Oklahoma	591
<i>Aspidiotus</i> —	
<i>destructor</i> , notes	858
<i>ostreaformis</i> . (See Fruit scale, European.)	
<i>pernicius</i> . (See San José scale.)	
sp., notes	654, 853
Asses, Poitou, measurements	169
Association of—	
American Agricultural Colleges and Ex- periment Stations	601
Official Agricultural Chemists	795
Aster, woody, identification, Wyo.	77
<i>Astragalus tristis</i> , destruction of grain aphids by, U.S.D.A.	452
<i>Asyndesmus lewisi</i> , feeding habits	51
<i>Athene noctua</i> , economic importance	651
Atmosphere, upper, haze of, U.S.D.A.	314
Atmospheric—	
conditions, effect on hardness of rain water	122
pressure. (See Barometric pressure.)	
temperature. (See Temperature.)	
turbidity, effect on solar radiation and skylight polarization, U.S.D.A.	314
Atoxyl, use against surra	883
<i>Atriplex hortensis</i> , insect and arachnid enemies of	853
Aucuba, pectins of	608
<i>Aulacaspis manzanitæ</i> n. sp., notes	356
<i>roseæ</i> . (See Rose scale.)	
Autolysis, effect on cholesterol	309
Automobiles, effect on road surfaces, U.S.D.A. relation to good roads	358 291
Autotherapy, notes	175
Avalanches, control in Switzerland	842
<i>Avena elatior</i> , germination experiments	143
<i>fatua</i> , germinative qualities	135, 538
studies	337
<i>flavescens</i> , culture in New Zealand	428

	Page.
Avocados, new, descriptions	838
U.S.D.A.	436
propagation and grafting, Hawaii.	234
<i>Azalea indica</i> , leaf gall affecting	48
<i>Azolla</i> , assimilation of nitrogen by	133
<i>Azotobacter chroococcum</i> as affected by ultra- violet rays	130
spp., studies	630
<i>Azotobacter</i> , fixation of nitrogen by	227
<i>Azotogen</i> , tests	733
Babcock tester, use, Cal.	71
<i>Babesia bigemina</i> , relation to anaplasmosis ..	584
studies	882
Babesiasis, transmission by ticks	584
<i>Baccha clavata</i> , notes, Okla.	355
<i>lemur</i> , notes	455
<i>Bacillus</i> —	
<i>abortus equinus</i> , notes	779
<i>abortus</i> , characteristics, U.S.D.A.	779
occurrence in milk	282, 305
persistence in inoculated animals ..	282
virulence of	677
<i>aceris</i> n. sp., description, Vt.	157
<i>amylovorus</i> , migration in host tissues ..	449
notes	49
Wash.	848
studies, Ark.	649
N.Y.Cornell	348
<i>anthracis</i> , effect on sheep	582
notes	378
<i>bronchisepticus</i> , relation to dog distem- per	682
<i>cholerae suis</i> in Dorset-Niles serum, Mich.	82
<i>coli</i> as a test organism for disinfectants, N.Dak.	803
relation to slime formation in soils ..	723
<i>dysenteriae</i> as affected by metamorphosis of house flies	357
<i>crispipellus</i> —	
detection after vaccinating	176
<i>suis</i> , heat resistance of precipitino- gens	882
types of	882
<i>extorquens</i> n. sp., notes	316
<i>izæ</i> n. sp., studies	845
<i>lactis fermentens</i> , studies	776
<i>lathyræ</i> n. sp., relation to sweet pea streak disease	352
<i>melanogenes</i> , treatment	549
<i>necrosis</i> , organism resembling in rabbits ..	677
<i>prodigiosus</i> , relation to rubber spotting ..	451
<i>proteus vulgaris</i> , notes	64
<i>pyogenes</i> , relation to contagious abortion ..	80
<i>radicola</i> , fixation of nitrogen by	733
Va.	629
prevalence in soils	423, 515
specialization of forms	733
testing cultures of, U.S.D.A.	30
<i>solanacearum</i> , description and treatment, Fla.	847
notes	423
variability	136
<i>subtilis</i> in condensed milk, Vt.	778
<i>suipesticus</i> , effect on rabbits	288
<i>suipestifer voidagens</i> , notes	883
<i>tuberculosis</i> . (See Tubercle bacilli.)	
<i>typhosus</i> as a test organism for disinfect- ants, N. Dak.	803

	Page.		Page.
<i>Bacillus</i> —Continued.		Bagworms, fungus disease affecting.....	45
<i>typhosus</i> as affected by metamorphosis of		injuriously to okra	653
house flies	358	Bakeries, inspection, N.Dak.....	661
<i>voldagsen</i> , organism resembling in man. 882, 883		in Virginia.....	567, 766
relation to hog cholera	482	Baking powder, albumin in, N.Dak.....	866
<i>vulgare</i> , penetration of eggshells by.....	765	examination, N.Dak.....	866
<i>Bacillus</i> , Koch's, method of entering the		Bakli, notes.....	443
body.....	884	Balanitis in sheep.....	783
of Schmorl, studies.....	478	Bamboo borer, shot-hole, notes.....	458
Preisz-Nocard, diagnostic value.....	281	notes, U.S.D.A.....	330
Bacon, curing and marketing.....	773	seed, analyses.....	463
wrapped cured, inspection in Texas..	61	Banana anthracnose, notes, Conn.State.....	547
<i>Bacteria</i> —		bunches, wrappers for, Hawaii.....	234
absorption of congo red by, U.S.D.A....	528	diseases, descriptions.....	350
activity in forest soils.....	325	notes, P.R.....	650
as affected by metamorphosis of house		treatment.....	749
flies.....	357	food products, manufacture and use	461
cellulose-destroying, characteristics.....	817	meal for pigs.....	572
decomposition of silicates by.....	316	Bananas, ash analyses, Ohio.....	861
determination in milk, U.S.D.A.....	75	changes in during ripening, U.S.	
soils, Iowa.....	824	D.A.....	462
effect on catalase production in milk,		culture in Fiji.....	642
U.S.D.A.....	717	dried, analyses.....	361
grain size and moisture content		fumigating with hydrocyanic acid	
of soils, Mich.....	20	gas, Hawaii.....	234
solubility of potash and phos-		reducing and nonreducing sugars	
phoric acid.....	315	in.....	503
in milk, soils, water, etc. (<i>See Milk,</i>		varieties for Philippines.....	839
<i>Soils, Water, etc.</i>)		in Seychelles.....	839
legume, fixation of nitrogen by, Va.....	629	Barium hydrate, diffusion in soils, Md.....	128
limitation of in soils.....	122	oxid, fixation of nitrogen by.....	822
lypolytic power on esters and fats.....	177	Bark beetles, identification.....	859
nitrogen-collecting, handbook.....	824	louse, oyster-shell. (<i>See Oyster-shell</i>	
nodule-forming, testing cultures of, U.S.		scale.)	
D.A.....	30	scurfy. (<i>See Scurfy scale.</i>)	
relation to callose in root hairs.....	326	Barley—	
citrus gummosis, Fla.....	247	analyses.....	367, 470
iodin compounds.....	133	Can.....	270
organic soil constituents.....	817	as a substitute for oats, Ohio.....	36
wilt diseases.....	243	awned and awnless, transpiration.....	135
root tubercle, specialization of forms.....	733	bran, methods of analysis.....	311
slime-forming, in milk.....	580	breeding experiments.....	138
surviving pasteurization, studies, U.S.		Chinese, varieties.....	530
D.A.....	73	continuous culture.....	227
symbiosis with <i>Ardisia crista</i>	30	cost of production, N.Dak.....	690
treatise.....	422	culture experiments.....	138, 427, 632
use of stains in study of, Va.....	630	Alaska.....	735
Bacterial tubercles in leaves.....	30	Ariz.....	426
Bacteriology, bibliography.....	626	Mont.....	630
household, text-book.....	298	Nebr.....	225
of dried soil.....	325	in Texas Panhandle, U.S.D.A....	429
foods.....	563	ears, abnormal, notes.....	446
milk.....	775	effect on milling quality of wheat, N.Dak.	866
papers on.....	676	enemies of.....	555
water, treatise.....	814	feeds, analyses, Wis.....	367
<i>Bacterium</i> —		fertilizer experiments..	126, 227, 625, 731, 736, 796
<i>briosii</i> , notes.....	246	Alaska.....	727
<i>casei</i> , studies.....	279	N.Y.State.....	22
<i>citriputeale</i> n. sp., description.....	650	germination.....	629
<i>deliense</i> n. sp., notes.....	136	as affected by fertilizers.....	327
<i>droseræ</i> , notes.....	580	fungicides.....	346
<i>pseudopestis murium</i> n. sp., notes.....	58	tests, Can.....	223
<i>solanacearum</i> , notes.....	646	germinative ability and vegetative force.	740
spp., descriptions.....	345	green, analyses.....	467
notes.....	243	growth as affected by fertilizer salts.....	329
<i>tumefaciens</i> , inoculation experiments.....	449	meteorology.....	510
notes.....	46	on volcanic ash, Alaska.....	726
Conn.State.....	547	Helminthosporium diseases of.....	645

	Page.		Page.
Barley—Continued.		Beans, relation of weight of seed to yield...	522, 633
hybrids, notes, Alaska.....	735	<i>Stizolobium</i> , culture in P. R.....	631
improvement by selection.....	532	sword, culture in Porto Rico, P. R....	631
irrigation experiments.....	182, 632	tepary, as a dry-land crop, Ariz.....	736
late blight, studies and bibliography.....	750	culture experiments, Ariz.....	426
liming experiments, Can.....	223	variation in due to fertilizers.....	435
loose smut, notes.....	150	varieties.....	228
rotation experiments.....	227	Ariz.....	426
seeding experiments.....	426	Can.....	222
Can.....	224	velvet. (<i>See</i> Velvet beans.)	
Nebr.....	225	Yokohama, yields, Fla.....	224
susceptibility to mildew.....	844	Bear grass, notes, Ariz.....	441
transformation of nitrogen by.....	133	Bedbugs, notes, U.S.D.A.....	454
<i>v. hominy</i> meal for pigs.....	671	Bee disease, Isle of Wight, investigations...	761
varieties.....	138, 530	diseases in Ontario, notes.....	57
Can.....	222	fly, life history.....	456
Mont.....	630	moth, life history and remedies, Tex....	859
N. Dak.....	225, 425	Beech leaf mold, fertilizing value.....	622
Nebr.....	225, 736	Beeches, periodicity in.....	442
U.S.D.A.....	428	Beef, baby, production.....	571
water requirements, U.S.D.A.....	826	fat, detection in lard.....	798
yields, Nev.....	138	growers' organization in Iowa.....	894
Barns, dairy, ventilation.....	474	industry in Argentina.....	870
disinfection, Pa.....	885	meal, notes.....	765
plans and specifications.....	390	production, importance of silage in,	
sanitary, relation to clean milk.....	500	N. C.....	69
Barnyard manure—		retail buying, U.S.D.A.....	194
effect on soil fertility.....	317	scrap, analyses.....	271, 467
fertilizing value.....	227, 427, 632, 737, 830	Ky.....	270
Ala. College.....	831	N. H.....	769
Miss.....	35	N. J.....	666
U.S.D.A.....	32	supply of United States.....	770
for grass lands.....	531	Beehives, cement, tests, P. R.....	653
hops, Oreg.....	534	Beekeeping, handbook.....	57
inoculation alfalfa with, Nebr.....	332	in Tennessee.....	458
Barometric pressure, effect on carbon dioxid		investigations, Tex.....	859
excretion in man.....	569	monograph.....	761
<i>Baryscapus</i> sp., notes.....	658	Beer industry in Philippines.....	118
Basi from sugar cane.....	118	yeast, dry, analyses and feeding value..	467
Basic slag. (<i>See</i> Phosphate slag.)		Bees, heredity in.....	860
Bat guano, analyses.....	516	notes.....	761
fertilizing value.....	129	queen, rearing.....	57
<i>Bauhinia esculenta</i>, notes.....	362	Beet aphid, remedies.....	454
Bayfield area, Wis., soil survey, U.S.D.A.....	17	caterpillar, striped, studies, U.S.D.A....	455
Bean aphid, remedies.....	454	chips, dried, methods of analysis.....	311
fly, notes.....	657	leaf silage, analyses, Wis.....	367
growing contest, notes, Cal.....	94	meal, manufacture and use.....	161
leaf beetle, notes, P. R.....	652	pulp, analyses.....	367, 467
roller, notes, P. R.....	652	digestibility.....	367
meal, analyses, Wis.....	367	dried, analyses, Ky.....	270
rust, notes.....	150	N. H.....	769
Beans as affected by fertilizers, Md.....	339	N. J.....	666
bush, lime-magnesia requirements.....	520	R. I.....	570
ere, culture experiments.....	830	Vt.....	769
fertilizer experiments.....	731	root tumors, notes.....	153
from Sudan, analyses.....	569	seed as affected by light.....	332
germination as affected by—		germination energy of.....	332, 538
fertilizers.....	327	tests.....	740
metallic compounds.....	528	top silage, analyses, Wis.....	367
growth as affected by fertilizer salts..	329	webworm, Hawaiian, notes, U.S.D.A....	456
hybridization experiments.....	433	spotted, studies, U.S.D.A....	455
irrigation experiments, P. R.....	638	Beetles injurious to coconut palms.....	858
Lima, improvement by selection, Cal..	540	sugar cane.....	858
Lyon, hybridization experiments, Fla..	228	Beets as affected by fertilizers.....	332
natural selection in.....	139	atavistic, composition.....	430
navy, ash analyses, Ohio.....	861	composition and yield as affected by	
plant nutrients removed by.....	837	sodium salts, R. I.....	420

	Page.		Page.
Beets, composition of descendants.....	833	Bibliography of—	
cooperative experiments.....	138	chlorid of lime in sanitation.....	512
culture experiments.....	331	chondriosomes in living plant cells.....	217
fertilizer experiments.....	23, 25, 127, 632	cookery books.....	567
field or fodder. (See Mangels.)		country churches.....	190
fungicidal treatment.....	326	cow-testing associations.....	375
germination as affected by fertilizers...	327	<i>Cysticercus ovis</i> , U.S.D.A.....	888
growth as affected by fertilizer salts...	329	dietetics.....	163
sulphur.....	215	disease resistance in apples, N.Y. State..	41
heredity of characters in.....	832	diseases.....	652
form and color in.....	332	drainage, Vt.....	785
inoculation.....	326	equine influenza.....	385
nitrogen appropriation by descendants...	832	evolution in <i>E. nothera</i>	321
sugar. (See Sugar beets.)		fermentation, alcoholic.....	715
content of root and character of		fire blight, N.Y. Cornell.....	348
descendants.....	832	fodder grasses of Indian forests.....	170
variability of descendants.....	832, 833	foods.....	360
Belts, pulling power.....	389	forestry.....	345
Benteak, notes.....	443	forests of Alabama.....	746
Benzin, petroleum, detection in ethyl alcohol.	312	Formicidæ.....	861
Benzoic acid, effect on meat.....	266	fruit scale control in Italy.....	854
Benzol, detection in ethyl alcohol.....	312	fungi in soils.....	825
Berberi—		Fusarium.....	445
cause and prevention.....	463	gonocytes and ovaries in fowls.....	874
infantile, in Manila.....	270	<i>Habronema muscæ</i> , U.S.D.A.....	83
relation to bacterial fermentation of rice.	269	heredity.....	67
diet.....	180, 460	in corn, Nebr.....	335
studies.....	664	<i>Heterosporium</i> spp.....	647
theory of.....	169	home economics.....	93, 567, 792
Bermuda grass, alkali tolerance, U.S.D.A....	330	hop aphid, U.S.D.A.....	254
culture, Okla.....	830	hydrocyanic acid in cherry laurel.....	133
eradication, U.S.D.A.....	330	industrial cooperation.....	595
<i>Bero-cera madagascariensis</i> , notes.....	855	insects, injurious.....	652
Berry wine, diminution of acidity in.....	117	kitchen equipment for army use.....	567
Berseem, notes.....	140	life zones and distribution areas in New	
Beschlæusehe. (See Dourine.)		Mexico, U.S.D.A.....	755
Betel nut palm plague, notes.....	446	lilies.....	341
Beverages, analyses.....	362	lime culture.....	746
methods of analysis.....	412, 800	meteorology, agricultural.....	811
Bibliography of—		micro-organisms in maple sap, Vt.....	157
abortion in cows, U.S.D.A.....	779	milk examination, U.S.D.A.....	718
after-ripening of seeds.....	527	moor soils of northwest Germany.....	514
agricultural cooperation.....	90	Myriapoda of Chile.....	58
agriculture.....	598	nitrate formation in soils, N. Y. Cor-	
apple maggot, N.Y. Cornell.....	561	nell.....	819
arboriculture, ornamental.....	148	nitrates in soils, Va.....	610
Argentine ant, U.S.D.A.....	563	nitrogen, atmospheric, fixation.....	417
asparagus beetle, 12-spotted, N.Y. Cornell	556	fixation by bacteria, Va.....	630
miner, N.Y. Cornell.....	556	U.S.D.A.....	527
associative action of bacteria with lactic		oak <i>Oïdium</i>	553
organisms, Mich.....	9	ox warble flies.....	856
bacterial flora of large intestine of horses..	466	pathology.....	174
bacteriology.....	626	periodicity in woody plants.....	443
barley late blight.....	750	pine reproduction in north polar region..	442
bee disease, Isle of Wight.....	762	pith-ray flecks in wood, U.S.D.A.....	44
beet webworm, spotted, U.S.D.A.....	456	plant hybridization, Miss.....	320
botany.....	327, 626	plants useful in dye making.....	626
bud variation in relation to fruit mark-		woody, of German East Africa.....	643
ings, Oreg.....	147	pollen of red clover.....	829
cacao canker.....	249	pollination.....	437
caffein, U.S.D.A.....	265	of pomaceous fruits, Oreg.....	541
carbon dioxid assimilation in plants.....	324	potato dry rot, Nebr.....	48
cereals, ground, in the diet.....	564	flea beetle, Me.....	259
cheese ripening.....	59	silver scurf, U.S.D.A.....	347
chemistry.....	501	<i>Puccinia dispersa</i>	346
cherry gummosis, Oreg.....	155	pulp and paper industry, U.S.D.A.....	119
chestnut bark disease, Conn.State.....	553	red peppers, U.S.D.A.....	264

Bibliography of—Continued.	Page.		Page.
red spider, U.S.D.A.	262	Biscuits, army, temperature during baking..	856
respiration of fruits and plant tissues in		Bitumens, tests.....	687
gases, N.Y.Cornell.....	539	Blackberries, cost of distribution.....	492
school feeding.....	162, 267	respiration in gases.....	135
gardening.....	296	N.Y.Cornell.....	538
seed germination as affected by light.....	525	Blackberry rusts, notes and treatment, N.C.	50
serpentine leaf miner, U.S.D.A.....	857	Blackhead in turkeys, notes, Can.....	273
sheep maggot fly.....	656	Blackleg, diagnosis.....	882
silver leaf disease.....	847	Blastomycosis, hepatic, in geese.....	83
smoke, effect on plant life.....	630	Blastula as affected by spermatozooids.....	66
toxicity.....	529	<i>Blissus leucopterus</i> . (See Chinch bug.)	
soil nitrogen.....	316	Blister beetles, notes.....	252
temperature, Mich.....	620	Blood, circulating, tubercle bacilli in.....	480
sugar.....	719	constituents, reproduction in immu-	
surra.....	176	nized horse.....	682
tetraplasy.....	67	dried. (See Dried blood.)	
tobacco breeding, Conn.State.....	537	flour, analyses.....	467
transpiration and water vapor retention		meal, analyses, Wis.....	367
in plants.....	524	iron-containing, effect on ani-	
tubercle bacilli, Ill.....	78	mals.....	671
United States Government publications		methods of analysis.....	311
on agriculture.....	598	of fowls affected with leukemia.....	285
vegetable growing.....	436	plasma and serum, rotation in various	
violet diseases.....	753	animals.....	881
violets.....	543	preservation with formalin.....	676
water requirements of plants, U.S.D.A..	826	reactions, heredity of.....	167
weathering of silicates.....	124	serum antitryptic power, diagnostic	
wilting in plants.....	523	value.....	477
wood structure.....	344	spectrophotometry of.....	408
worms in blood vessels of horses.....	784	Blow flies, review of investigations.....	656
writings of J. B. Smith.....	353	Blue grass, culture experiments.....	631
yoghourt.....	59	hay, ash analyses, Ohio.....	861
zeolitic properties of ground phonolite		Kentucky, culture in the Ozarks,	
and lime trass.....	519	Mo.....	427
Bicalcium phosphate, manufacture and fer-		seeding experiments	
tilizing value.....	128	on ranges, U.S.D.A.....	531
Bichlorid of mercury. (See Corrosive subli-		seed, adulteration and misbrand-	
mate.)		ing, U.S.D.A.....	144
Bija sal, notes.....	443	gum plantations of Nilgiris.....	443
Bile, bovine, analyses.....	377	Blueberries, culture, U.S.D.A.....	148
of tubercular animals, virulence.....	582	Bog water, effect on Tradescantia root hairs.	523
Biochemische Zeitschrift, index.....	120	Boll weevil. (See Cotton-boll weevil.)	
Biochemistry, treatise.....	201, 408	Bollworm. (See Cotton bollworm.)	
Biographical sketch of Popence, E. A.....	699	<i>Bombyx mori</i> . (See Silkworm.)	
Biologic diagnostics, inconsistencies of.....	500	Bone, cracked, analyses, N.H.....	769
products, production and distribu-		fertilizing value.....	129
tion in Holland.....	377	ground, analyses, Wis.....	367
Biology, color standards in.....	762	manures, fertilizing value.....	737
experimental, papers on.....	676	meal, analyses, N.H.....	769
use of "normal" curve of frequency		fertilizing value.....	319, 418, 519, 829
in.....	168	Bones, analyses, R.I.....	626
Blotite, fertilizing value.....	625	Bookkeeping, text-book.....	792
Birch leaf-mining sawfly, notes, Can.....	252	Books on—	
roller, notes, Me.....	251	agrarian matters.....	391
Bird guano, fertilizing value.....	129	agricultural cooperation.....	89, 188, 595
Birds, Australian, feeding habits.....	756	engineering.....	484
destruction of grain aphids by, U.S.		possibilities in United States	
D.A.....	452	and western Canada.....	596
effect on reforestation, U.S.D.A.....	545	products, commerce in.....	293
migratory, regulations for protection,		agriculture.....	594
U.S.D.A.....	554, 555	elementary.....	93, 193, 298
of Ohio, Ohio.....	51	in Germany.....	896
Virginia, treatise.....	554	alcohol production by yeast.....	714
protection, officials and organizations,		animal diseases.....	880
U.S.D.A.....	852	husbandry.....	570, 598
relation to chestnut blight.....	754	bacteria.....	422
study of in schools.....	193	nitrogen collecting.....	824

Books on—Continued.	Page.	Books on—Continued.	Page.
bacteriology, household.....	298	foods.....	360, 412
of water.....	814	fruit culture.....	837
beekeeping.....	57	fur farming.....	672
biochemistry.....	201, 408	gardening.....	42, 341, 441, 495, 840
birds of Virginia.....	554	grain, forage, and pasture crops.....	530
bread.....	361, 660	grasses.....	139
broom-corn culture.....	737	heating and ventilation.....	390
building and construction methods.....	86	heredity and evolution.....	665
cacao products.....	312	histology.....	676
California Redwood Park.....	44	home economics.....	162, 266, 496
candy making.....	60	honey chemistry.....	109
cane-sugar industry.....	432	horses.....	573
casein.....	312	v. motor power for farm and trans-	
catalysis.....	504	portation.....	388
cattle raising.....	368	horseshoeing.....	292, 682
on western ranges.....	666	horticulture.....	193
cereals, ground, in the diet.....	564	house flies.....	656
chemical analysis.....	203, 307, 506	incubation and brooding.....	373
technology.....	413	industrial cooperation.....	594
chemistry.....	792, 801	insecticides, fungicides, and weed killers.....	341
industrial.....	107	insects, instinct of.....	52
physiological and pathological.....	267	irrigation.....	181, 289, 683
chlorid of lime in sanitation.....	512	land tenure in England.....	895
clover.....	140	title registration.....	895
coconuts.....	840	lilies.....	341
Coleoptera of British India.....	57, 358	live-stock breeding.....	68
color standards in biology.....	762	lumber measurement.....	240
community cooperation.....	294	malaria.....	759
cooking.....	61, 362, 464, 661, 766	manures.....	820
cooperage.....	944	meteorology.....	615
corn culture.....	830	micro-chemistry.....	801
cotton.....	738	milk, desiccated.....	777
country churches.....	190, 294	hygiene.....	877
cultivation.....	329	testing.....	206
cyanamid.....	518	mosquitoes of North and Central America	
dahlias.....	441	and West Indies.....	357
dairying.....	93, 775	motors and dynamos.....	892
dams, earth.....	289	nature study.....	495
deer breeding.....	171	Nematocera of British India.....	57
diet.....	267, 360, 661	nitrogen, atmospheric, fixation.....	417
and hygiene in schools.....	363	nutrition.....	266
dietetics.....	163	oil and fat analysis.....	811
electrical engineering.....	893	ophthalmology for veterinarians.....	377
embryology of chicks and pigs.....	371	pathology.....	174
engineering.....	289	pavement specifications.....	387
engines, gasoline.....	86	perennials and herbaceous borders.....	840
internal combustion.....	184	pharmacology for veterinarians.....	580
entomology.....	555, 853	physical-chemical tables.....	107, 201
farm accounting.....	792	physiology, human.....	767
buildings.....	186, 689	pigs.....	872
life.....	598	plant alkaloids.....	503
farming.....	293	breeding in Scandinavia.....	636
fauna of Hawaii.....	250	classification.....	216
fermentation, alcoholic.....	714	diseases.....	150, 546, 644
processes in breweries, dis-		plants.....	420
tilleries, and yeast fac-		of Connecticut Valley in Massachu-	
tories.....	509	setts.....	216
fertilizers.....	193, 213, 517	poultry.....	69, 193, 371, 573
for truck crops.....	837	houses.....	689
flour milling.....	263	power for the farm.....	688
flower gardening.....	239	preservation of fruits and legumes.....	116
food accessories.....	265	protein chemistry.....	408
analysis.....	204, 506	protozoa.....	360
and drug laws in United States.....	266	rabies.....	679
chemistry.....	598	river discharge.....	487
preservation.....	264	road and bridge specifications.....	487
supply of Germany.....	162	roads.....	388
Great Britain.....	162	rotation of crops.....	139

Books on—Continued.	Page.		Page.
rubber culture.....	644	Brake, prony, description and use.....	488
rural economics.....	894	Bran, analyses.....	467, 769
schools.....	494	R. I.....	570
welfare.....	190	methods of analysis.....	311
school feeding.....	162	(See also Wheat, Rye, etc.)	
gardens.....	598, 792	Branch and twig borer, notes.....	657
sheep raising on western ranges.....	666	Brandy, adulteration and misbranding,	
shrubs.....	842	U. S. D. A.....	766
silos and silage.....	87	Brassica grafts, studies.....	434
soils.....	193, 315	Raphanus hybrids, studies, Miss.....	320
springs and ground water.....	15	Braxy in sheep.....	179
strength of materials.....	890	Bread, army, digestibility.....	864
sugar-beet industry in Europe.....	142	determination of loaf volume.....	565
manufacture.....	113, 312	quality.....	864
production.....	233	digestibility.....	565, 660
swamp lands.....	890	electric oven for baking, Minn.....	263
sweet clover.....	833	fermentation studies.....	864
terminology of animal and plant struc-		making, diastase in.....	765
ture.....	665	physical chemistry of.....	564
trees.....	842	self-rising, paper on.....	465
of America.....	441	treatise.....	361, 660
Great Britain and Ireland.....	747	use of calcium chlorid in.....	565
Hawaii.....	643	Breeding. (See Animal breeding and Plant	
trypanosome diseases.....	77	breeding.)	
vegetables of California.....	435	Breweries, fermentation processes in.....	509
veterinary medicine.....	476	Brewers' grains—	
violets.....	149, 543	analyses, N. H.....	769
water examination.....	506	R. I.....	570
subterranean.....	15	ash analyses, Ohio.....	861
weather forecasting.....	615	dried, analyses.....	467
weeds of Indiana.....	144	Ky.....	270
wheat crop of India.....	789	N. J.....	666
<i>Boophilus annulatus</i> . (See Cattle ticks.)		Vt.....	769
Bordeaux mixture, wetting power, increas-		Wis.....	367
ing.....	850	methods of analysis.....	311
Borers injurious to timber.....	761	nutritive value.....	665
Boric acid as a fish preservative.....	659	Bricks, lava, efflorescence on, Hawaii.....	203
determination in presence of mag-		Bridges, concrete, internal temperature	
nesium chlorid.....	609	range.....	786
Borna disease in horses, investigations.....	587	construction.....	86, 182
<i>Bornetina corium</i> , notes.....	752	materials for roadways of.....	785
Boron compounds, effect on plant growth... 219		of California, notes.....	386
fixation of nitrogen by.....	822	paper on.....	291, 292
<i>Bostrychus monachus</i> , notes, P. R.....	652	specifications.....	487
<i>Boswellia serrata</i> , tapping experiments.....	43	steel highway, specifications,	
Botanical cross section of northern Missis-		U. S. D. A.....	688
sippi.....	513	Brome grass—	
features of Algerian Sahara.....	626	culture experiments, N. Dak.....	226
Botany, bibliography.....	327, 626	Nebr.....	225
of Hawaii.....	239	false, description and eradication.....	142
Botflies, notes, U. S. D. A.....	454	seeding experiments on ranges, U. S. D. A.....	531
(See also Sheep botfly.)		yields, Mont.....	631
<i>Botrytis cinerea</i> . (See Grape gray rot.)		Bromin, absorption by vegetable oils and	
spp., notes.....	243, 650	fats.....	612
<i>vulgaris</i> , studies.....	753	determination in water.....	797
Povines—		<i>Bromus inermis</i> . (See Brome grass.)	
immunization against tuberculosis.....	584	spp., culture in New Zealand.....	428
male, collection of urine and feces from.. 408		Brooder houses, colony, construction, N. Y.	
parathyroid glands of.....	377	Cornell.....	293
Bovovaccine, von Behring's, tests, Cal.....	884	Broom as a sand binder.....	427
Boys' agricultural clubs, notes.....	394, 395	corn as a feeding stuff, Can.....	223
clubs, notes.....	93	culture experiments, Ariz.....	426
corn-club work, notes, U. S. D. A.....	193	Hawaii.....	225
growing contests, Md.....	193	handbook.....	737
menus for.....	464	in Texas Panhandle,	
pig clubs in Alabama.....	792	U. S. D. A.....	430

	Page.		Page.
Broom corn millet, culture in Texas Pan-		Butter—Continued.	
handle, U.S.D.A.	429	overrun in, determination	777
notes	395	quality as affected by legumes	278
varieties, Can.	222	standards, U.S.D.A.	777
U.S.D.A.	32	sterilization	280
yields, U.S.D.A.	32	storage, factors affecting flavor, U.S.D.A.	71
making, notes	395	testing	876
plant seed, germination tests	740	yields of different breeds	475
Spanish, notes, Ariz.	441	Buttercups, destruction with sulphate of am-	
Brown-tail moth—		monia	530
notes, Can.	252	Buttermilk as affected by cooking	160
Me.	251	dried casein from	676
occurrence in France	558	from pasteurized cream, improve-	
remedies, N.Y. State	762	ment, Ill.	674
<i>Bruchophagus funebris</i> . (See Clover seed chal-		Butyrometer, modified, for cheese	311
cid fly.)		<i>Butyrospermum parkii</i> , description	60
<i>Bruchus prosopis</i> , life history, Hawaii	253	Cabarrus County, N.C., soil survey, U.S.D.A.	16
Brush disposal, U.S.D.A.	545	Cabbage, ash analyses, Ohio	861
meal, composition and digestibility	373	bacterial rot, notes, Conn. State	547
Buckwheat—		club root in South Africa	846
analyses, Ky.	270	treatment	752
bran, analyses, Vt.	769	culture	338
feeds, analyses, Wis.	367	Mont.	639
fertilizer experiments	624, 625, 821	experiments	331
N.Y. State	22	disease resistance in	646
hulls, analyses, N.J.	666	hybrids, inheritance in, Va.	638
liming experiments, Can.	223	insects affecting	338
middlings, analyses, N. J.	666	maggot, notes, Oreg.	158
digestibility, Md.	367	varieties, Ohio	41
nematodes affecting	151	worm, notes, P.R.	652
water requirements, U.S.D.A.	826	Cabuya fiber, strength of, U.S.D.A.	313
Bud variation, relation to fruit markings,		Cacao butter, detection	613
Oreg.	147	canker, notes and bibliography	248
Budding, notes	838	diseases, notes	155, 345, 547, 749
Buffalo gnat, notes, U.S.D.A.	454	fertilizer and mulching experiments	42
Building and construction methods, treatise	86	shading experiments	746
stone deposits in Virginia coastal		insects affecting	653
plain	513	moth, parasites of	855
Buildings, lightning protection of	88	preparation	340
public, inspection in South Da-		products, treatise	312
kota	567	shells, determination in cacao prepara-	
Bulloch County, Ga., soil survey, U.S.D.A.	16	tions	205, 611
Bulls, maintenance test with oat hulls, Md.	367	witches' broom disease, notes	851
Burkheiser salt, fertilizing value	214	<i>Caccacia costana</i> , habits and remedies	758
Butter—		Cactus weevils, notes	562
adulteration, detection	508	Cadaverin as a source of ammonia, Iowa	723
anchovy, examination	361	Cadmium oxid, effect on germination of	
as affected by cold storage	268	seeds	528
fat globules in cream	579	<i>Cæoma laricis</i> , notes	554
catalase in	508	Caffein, effect on mental and motor efficiency	265
cost of distribution	492	elimination and toxicity, U.S.D.A.	265
creamery, temperature at Canadian ship-		Caffeols, origin	361
ping points	673	Caffetannin, notes	434
examination	280	<i>Calandra oryza</i> . (See Rice-weevil.)	
export trade of Canada	673	Calcium—	
factors affecting quality, Ohio	674	carbonate, effect on legume bacteria	733
fat. (See Fat and Milk fat.)		wine	117
fatty acids of	508	methods of analysis	311
from creameries in Alberta, quality	376	caseinate, basic, preparation, N.Y. State	10
homogenizer for	799	chlorid, effect on activity of malt diastase	528
homogenizing	880	germination of seeds	327
making in South Australia	280	use in bread	565
on the farm, U.S.D.A.	580	cyanamid—	
methods of analysis	413	fertilizing value	23, 125, 127, 213
moisture content, control, Vt.	777	Ala. College	831
		manufacture, progress in	730

Calcium—Continued.	Page.		Page.
cyanamid—continued.		Canarium nut milk as a food for infants.....	566
mixing with superphosphate.....	24	Canary grass, varieties, Can.....	222
production and use.....	126, 213, 517	Candlenut oil, detection.....	613
studies.....	127	Candy making, treatise.....	60
use against <i>Colaspidema atrum</i> and dodder.....	561	Cane, culture in Burma.....	736
determination in foods.....	809	Japanese, culture experiments, Fla.....	224
plant ashes, P.R.....	610	sugar, calculation tables.....	113
plants.....	797	industry, treatise.....	432
effect on toxicity of salts in nutritive solu- tions.....	322	Canine distemper. (See Dog distemper.)	
fluosilicate, fertilizing value.....	823	Canker in orchards, treatment.....	348
in Asiatic foodstuffs.....	64	Canning clubs in Mississippi.....	495
magnesium ratio in the diet.....	565	new method.....	867
metabolism in infants.....	166	Cantaloups. (See Muskmelons.)	
nitrate—		<i>Cantharoctonus stramineus</i> n. sp., description..	563
assimilation by mold fungi.....	29	Caoutchouc. (See Rubber.)	
effect on assimilation of phosphates..	318	Cape Girardeau County, Mo., soil survey, U.S.D.A.....	17
phosphorite.....	624	Capillarity, use in biochemical analysis.....	408
fertilizing value.....	23, 125, 213, 423, 829	Capital, concentrated, effect on labor and socialistic movements.....	491
for mangels.....	830	Caproic acid in butter, constitution.....	508
manufacture, progress in.....	730	Capsella, constant variants of.....	136
mixing with superphosphate.....	214	<i>Capsus solani</i> , notes.....	454
production and use in 1911-12.....	126, 213	Caraway moth, biology and importance....	759
treatment with oil.....	214	Carbohydrate metabolism in ducks.....	171
nitrite, fertilizing value.....	331	relation to thyroid secretion.....	868
oxid, diffusion in soils, Md.....	128	Carbohydrates—	
phosphate, diffusion in soils, Md.....	128	determination in cereal products.....	799
effect on germination of seeds.....	328	function in nutrition.....	868
in animal nutrition.....	869	higher, preparation and detection.....	408
physiological functions in plants.....	528	of shoots of <i>Sasa paniculata</i>	803
potassium permutate, fertilizing value..	211	physiology in the body.....	663
retention by pigs, studies.....	66	transformation in the animal organism...	63
salts, effect on generation of trypsin....	662	variations of in leaves.....	827
sulphate. (See Gypsum.)		Carbolic acid, use against contagious abortion in cattle, U.S.D.A.....	696
sulphite, fertilizing value.....	521	Carbon—	
Calf dysentery, immunization.....	581	and alumina, fixation of nitrogen by....	417
treatment.....	680	assimilation of plants, studies.....	28
feeds, analyses.....	467	bisulphid, fertilizing value.....	25
meals, analyses, N.H.....	769	fumigation, Ky.....	640
California College, organization and scope..	191	dioxid—	
Redwood Park, booklet.....	44	assimilation in plants.....	324
Station, notes.....	96	determination in expired air.....	167
report of director.....	899	water.....	808
University, notes.....	96	elimination by nerves.....	466
Callose, occurrence in root hairs.....	326	excretion after muscular work.....	569
<i>Calonectria flavida</i> , notes.....	155	as affected by barometric pressure.....	569
<i>nivalis</i> n. sp., description.....	445	fertilizing, effect on plant growth....	417
Calves, dairy, raising experiments, Ill.....	771	in soils, relation to bacterial activity..	423
destruction by cotton-seed meal, N.C.	77	production during mental work.....	768
feeding experiments... 169, 170, 468, 571, 668		monoxid, detection.....	610
Ky.....	277	tetrachlorid fumigation, Ky.....	640
immunization against tuberculosis,		Carex, rusts affecting, in North America....	750
Cal.....	884	Carnations, fertilizer experiments.....	840
parathyroid glands of.....	377	Carob, notes, U.S.D.A.....	330
raising, emulsion system.....	369	Carotin formation, relation to mitochondria.	827
experiments.....	571	in ripening tomatoes.....	132
sex control in.....	468	<i>Carpocapsa pomonella</i> . (See Codling moth.)	
slaughtering in Great Britain.....	571	Carrots, growth as affected by sulphur.....	215
Cambium miners, notes, U.S.D.A.....	44	irrigation experiments.....	427
Camphor, detection in ethyl alcohol.....	312	seeding experiments.....	432
trees, insects affecting.....	853	varieties.....	530
<i>Camponotus herculeanus ferrugineus</i> , embry- ology.....	860	Can.....	222
<i>Campoplex</i> n. spp., descriptions.....	563	yield as affected by time of thinning.	431
<i>Campylenidia curvata</i> , notes.....	252		
Canadian fruit marks act.....	868		

	Page.	Cattle—Continued.	Page.
<i>Caryoborus gonagra</i> , life history, Hawaii	253	floating horns of	771
Casein—		Gayal and Gaur, similarities	571
antigenic properties	174	heredity of poll character in	68
as affected by rennin, N.Y. State	805	immunization against East Coast fever	476
compounds, composition and properties, N.Y. State	9	tuberculosis	499, 886
preparation and properties	805	industry in Argentina	170, 171
determination in milk chocolate	799	Australia	570
tea and coffee	799	the French Alps	190
dried, manufacture	676	infection with <i>Trypanosoma americanum</i>	680
factors affecting precipitation	800	injury due to grazing, U.S.D.A.	543
hydrolysis by trypsin	202	inoculation with abortion bacillus	779
industry in Europe	173	Jersey-Angus crosses, notes	171
judging	411	measurements	68, 169, 571
manufacture	673	microbial flora of large intestine	466
and use, treatise	312	of Argentina	468
media for milk analysis, U.S.D.A.	718	Dutch East Africa	468
Cashew, notes	746	Italy	571
Cassava bran, analyses and feeding value	769	Wales	571
culture experiments	830	plague. (See Rinderpest.)	
fertilizer experiments	829	poisoning by larkspur, U.S.D.A.	280
flour and starch, examination	361	raising in Jamaica	570
root, notes	362	Tunis	369
Cassia, ground, analyses	462	on the range, treatise	666
<i>Castilla elastica</i> , culture in Dominica	748	treatise	368
Castilla seed, prolonging viability of, P.R.	642	rotation of blood plasma and serum in	881
Castor bean ash, analyses	714	scarcity in Great Britain	571
floral anomalies in	629	Tarentais, origin and characteristics	68
lipase as affected by manganous sulphate	713	ticks as affected by arsenical dips, U.S.D.A.	287
meal, detection in feeding stuffs	205	control in Tennessee	653
oil, detection	613	eradication in Georgia	384
in ethyl alcohol	312	life history, Ala. College	585
Castration—		notes, Tenn.	658
effect on horn growth in sheep	772	(See also Ticks.)	
internal organs	168	Welsh black, studies	571
relation to secondary sexual characters in Brown Leghorns	69	zebu, crossing experiments, P. R.	666
Catalase in butter	508	Cauliflower club root in South Africa	846
Catalysis, treatise	504	Cauliflowers—	
Catch crops, notes	331	cost of production	595
Cattle—		culture	338
Algau-African crosses, notes	171, 369	Mont.	639
as affected by certain alkaloids	476	insects affecting	338
breeding experiments, P.R.	666	winter, culture and marketing, La.	338
for weight and milk production. in Alaska, Alaska	770	Cave deposits, analyses	516
Denmark and Sweden	666	<i>Cecidomyia destructor</i> . (See Hessian fly.)	
Dutch East Africa	666	Cedar rust, effect on apple leaves, Va.	648
Holland	666	infection of apple leaves, N. C.	49
Rhodesia	273	Cedars, list	842
Sao Paulo	368	Celery blight or rust, studies	846
West Flanders	771	culture, Mont.	639
British breeds	571	in Michigan, Mich.	145
castration	168	wild, growing for wild ducks	373
Chiana and Romagna breeds, compari- son	68	Cellulose—	
crossing with zebus	369	as a source of energy for nitrogen fixation, U.S.D.A.	527
dairy Shorthorn, breeding and selection	473	content of germinating seeds	525
determination of age	368	destruction in soils	528
hemoglobin in	68	determination	506
Devon, notes	571	digestibility	65
dipping at short intervals	886	fermentation	528
tanks for	87	studies	201
diseases, notes, Miss	676	variations of in leaves	827
domestication and improvement	68	Cement—	
factors affecting pulse rate	66	as affected by alkali salts and sea water	686
feeding experiments	65, 272, 468	various substances	891
		Portland, control of initial setting time	488
		methods of testing and of anal- ysis	290

	Page.		Page.
Cement —Continued.		Chaparral, eradication by goats, U.S.D.A.....	543
Portland, specifications.....	290	Charbon. (<i>See</i> Anthrax.)	
rollers, construction, Mont.....	688	<i>Chatopsis ænea</i> , notes, U.S.D.A.....	454
sand, investigations.....	183	Chayote, culture in Louisiana, U.S.D.A.....	534
<i>Cephalurus mycoidea</i> , notes.....	345	notes.....	461
Ceratitis, African species.....	760	Cheese, analyses.....	59, 376, 863
<i>Ceratitis capitata</i> , breeding in bananas.....	54	as affected by feeding stuffs.....	173
notes.....	257	"Bankrote," red coloring in.....	376
Hawaii.....	234	brine-soluble compound of.....	805
remedies.....	656	Caerphilly, manufacture and quality.....	676
<i>Ceratoma trifurcata</i> . (<i>See</i> Bean leaf-beetle.)		Cheddar, manufacture.....	475
<i>Ceratonia siligua</i> , notes, U.S.D.A.....	330	from pasteurized milk, U.S.D.A.....	475
<i>Ceratophyllus fasciatus</i> , distribution on rats.....	755	comparison of types.....	564
Ceratopogoninae, blood-sucking, of Brazil.....	54	Coulommier, manufacture.....	777
<i>Cercomonas termo</i> , notes.....	316	curing. (<i>See</i> Cheese, ripening.)	
<i>Cercospora beticola</i> , notes.....	153	Dorset-Blue, manufacture and quality.....	676
treatment, U.S.D.A.....	48	export trade of Canada.....	673
<i>personata</i> , notes.....	347	factories in Norway.....	897
<i>sacchari</i> , notes.....	345	Gloucester, manufacture and quality.....	676
<i>vaginæ</i> , notes, P.R.....	45	Grana, warm-chamber method of making.....	880
Cereal —		homemade, manufacture.....	675
cropping, relation to soil sanitation....	516, 820	making at Lodi Experiment Station.....	777
diseases, notes.....	845	ferment serum for.....	280
Can.....	242	from pasteurized milk.....	674
dry spot, relation to fertilizers.....	46	in South Australia.....	280
Field Station in California.....	99	selection of ferments in.....	777
leaf spot, notes.....	46	marketing, Wis.....	675
products, ash analyses, Ohio.....	861	methods of analysis.....	810
methods of analysis.....	799	milk, pasteurization.....	376
snow mold, studies.....	47, 244	North Wilts, manufacture and quality.....	676
zawal or zakvat, studies.....	244	nutritive and fuel value.....	564
Cereals —		overripe, nutritive value.....	59
breeding experiments, N.Dak.....	226	Parmesan, manufacture.....	777
cooked, analyses.....	660	Portuguese, analyses.....	173
culture experiments.....	331	recipes.....	564
N. Dak.....	226, 425	ripening by electricity.....	675
in India.....	736	notes.....	59
Texas Panhandle, U.S.D.A.....	428	studies, N.Y.State.....	9
fermentation in.....	269	shrinkage in.....	777
ground, handbook and bibliography.....	564	testing.....	876
growth as affected by meteorology.....	510	whole milk, standards, U.S.D.A.....	777
improvement by selection.....	532	Chemical analysis, treatise.....	203, 307, 506
irrigation, Nebr.....	736	physical tables, book.....	107
experiments, N.Dak.....	226	station at Alnarp, report.....	119
sensitiveness to fungicidal treatment.....	151	technology, treatise.....	413
use in the dietary, Ohio.....	862	Chemicals, effect on starch grains.....	409
varieties.....	427	Chemistry —	
Ariz.....	426	agricultural, contributions of H. Riitt-	
N. Dak.....	226	hausen.....	501
Nev.....	138	progress in.....	408, 795
(<i>See also</i> Grains and specific kinds.)		analytical, treatise.....	506
Cerebrospinal meningitis —		colloid, application to agriculture.....	408
in horses, investigations.....	587	dictionary.....	801
notes.....	304, 499	fermentation, progress in 1911.....	107
outbreak in Kansas and Nebraska.....	587	industrial, manual.....	107
<i>Cereus forbesii</i> as a host of mistletoe.....	352	inorganic, treatise.....	801
Cerium oxid, effect on germination of seeds..	528	of fats, progress in 1911.....	108
<i>Cervus</i> spp., breeding experiments.....	171	organic, treatise.....	801
Cestodes injurious to muskrats.....	484	papers on.....	676
<i>Chaetophorus delicata</i> n. sp., description, Me..	654	physiological and pathological, treatise..	267
<i>Chalcis compsiluræ</i> n. sp., description.....	562	progress in 1912.....	501
<i>Chalepus dorsalis</i> , notes, Md.....	353	text-book.....	792
<i>Chalioides junodi</i> , notes.....	758		
Chalk as a neutralizer for sour milk bacteria..	877		
<i>Chamæcyparis nootkatensis</i> , biennial fructification, U.S.D.A.....	543		
Changa, parasites of.....	653		

	Page.		Page.
Cherries—		Chinch bug, notes, Can.....	252
composition as affected by irrigation,		Mo	854
Idaho.....	236	Chio.....	793
cost of production.....	439	remedies, Kans.....	653
culture in Alaska, Alaska.....	743	<i>Chionaspis furfura</i> . (See Scurfy scale.)	
dried, preparation and use, U.S.D.A.....	462	<i>lintreri</i> , notes, Me.....	251
growth as affected by meteorology.....	510	Chlorid of lime—	
new, descriptions, N.Y.State.....	838	as a milking machine sterilizer, N.Y.Cor-	
respiration in gases.....	135	nell.....	578
N.Y.Cornell.....	538	water purifier.....	315
sunburn of.....	547	in sanitation, treatise and bibliography..	512
varieties for Pacific Northwest.....	745	<i>Chloridea obsoleta</i> . (See Cotton bollworm.)	
resistant to disease.....	246	Chlorids, effect on activity of malt diastase..	528
Cherry—		Chlorin, determination in foods.....	809
ermine moth, notes.....	252	rice, Hawaii.....	231
fruit flies, investigations, N.Y.Cornell....	55	Chloroform, detection in ethyl alcohol.....	312
gummosis, studies and bibliography, Oreg..	154	extract of soils, Tex.....	801
laurel, hydrocyanic acid in.....	133	Chlorophyll—	
sawfly leaf miner, notes.....	252	formation as affected by manganese.....	323
slug, notes, Oreg.....	158	relation to mitochondria.....	827
Chess seed, analyses, Wis.....	367	relation to formation of formaldehyde....	132
Chestnut—		state of in plants.....	323
bark disease, studies.....	156, 651, 753	Chlorosis of plants, investigations.....	826
Conn.State.....	552, 753	Chocolate, manufacture.....	312
U.S.D.A.....	451, 553	value in the diet.....	664
black canker, studies.....	156, 351	Cholesterol, determination.....	309
blight, control in Pennsylvania.....	753	Cholin in dried herring roe.....	863
dissemination.....	351, 753, 754	use against tumors.....	476
in China.....	753	Chondriosomes in living plant cells.....	217
treatment.....	754	Chop-feed, analyses.....	769
Japanese, resistance to black root rot....	553	Chou moellier. (See Marrow cabbage.)	
trees, diseased, treatment.....	755	Chromogens, formation in plants.....	421
Chick pea, culture experiments.....	538	plant respiratory, absorption of	
Chicken bug, Mexican, notes, U.S.D.A.....	454	oxygen by.....	324
feeds, analyses, Ky.....	270	Chromosomes, nature and importance.....	665
soup, condensed, examination, N.		significance in heredity.....	321
Dak.....	659	structure.....	67
Chickens—		Chrysanthemum leaf miner, remedies.....	55
hatching and rearing, Cal.....	574	Chrysomelidae of Philippines.....	657
immunity against anthrax bacillus.....	378	<i>Chrysomyia macellaria</i> . (See Screw-worm.)	
raising, N.J.....	574	<i>megacephala</i> , notes.....	482
in Alaska, Alaska.....	770	<i>Chrysopa californica</i> , notes, U.S.D.A.....	261
(See also Fowls, Poultry, etc.)		<i>Chrysophlyctis endobiotica</i> , notes.....	243
Chicks, digestion in.....	372	Churches, country, handbook.....	294
embryology of.....	371	improvement.....	594
feeding experiments, N.Y.Cornell....	273	treatise and bibliography.....	190
Chicory, notes.....	338	Chymosin, secretion by young animals.....	665
preparation and methods of analysis.....	660	<i>Cibotium chamissoi</i> , analyses, Hawaii.....	270
Sclerotinia disease of.....	646	Cicada, periodical, notes, Ohio.....	793
Children—		Cicadas, notes.....	558
as affected by meat ingestion.....	365	Cider, chemistry and biology of.....	116
care of in the home.....	465	making, new methods in.....	798
feeding.....	465	sickness, investigations.....	208
food requirements.....	464	Cigarette beetle as affected by Roentgen rays.	359
infection with bovine type of tubercle		predaceous enemies of.....	359
bacilli.....	382	prevalence in Philippines.....	458
nursing, tuberculosis in.....	382	<i>Cimex lectularius</i> . (See Bedbugs.)	
raw <i>v.</i> boiled milk for.....	360	Cinnamon, ground, analyses.....	462
sugar in dietary of, U.S.D.A.....	460	Cinquefoil, shrubby, notes, Vt.....	741
Children's gardens. (See School gardens.)		Citranges, paper on.....	839
Chilies. (See Pepper.)		<i>Citromyces</i> spp., studies.....	547
<i>Chilocorus similis</i> . (See Asiatic lady beetle.)		Citron, dried, preparation and use, U.S.D.A..	462
Chinch bug, control in Illinois.....	53	<i>Citrullus vulgaris</i> , notes.....	362
egg parasite of.....	854	Citrus anthracnose, notes, P.R.....	650
false, note.....	252	die-back, investigations, Fla.....	237, 248
notes.....	252	diseases, notes.....	350

	Page.		Page.
Citrus fruits as affected by oil insecticides...	354	Clover—	
changes in during ripening, Fla...	641	alsike, varieties.....	139
culture in Gulf States, U.S.D.A...	542	bur, notes, U.S.D.A.....	299
fertilizer experiments, Fla.....	237	canker, notes.....	150, 446, 447
P.R.....	637	cost of production, N.Dak.....	690
lime-magnesia requirements.....	520	crimson, culture, U.S.D.A.....	633
new, paper on.....	839	in Porto Rico, P.R.....	631
notes, Hawaii.....	235	culture experiments.....	631
propagation, U.S.D.A.....	542	Alaska.....	735
protection against frost,		in the Ozarks, Mo.....	428
U.S.D.A.....	542	manual.....	140
scale insects affecting.....	654	cut, analyses, Vt.....	769
(See also Oranges, Lemons, etc.)		cutworm, studies, U.S.D.A.....	455
groves, cost of smudging.....	339	effect on nitrogen content of soils, Can...	211
gummosis, studies, Fla.....	247	Egyptian, notes.....	140
mealy bug, notes, P.R.....	652	fertilizing value, Can.....	224
red spider, remedies.....	459	for summer silage.....	473
scab, notes, Fla.....	242	fungicidal treatment.....	326
soils, fertilization.....	317	germination as affected by fertilizers....	327
stem-end rot, studies, Fla.....	247	ground, examination and standardiza-	
stocks, tests, P.R.....	637	tion.....	462
thrips, notes, Ariz.....	453	growth as affected by fertilizer salts....	329
trees, frosted, pruning, Cal.....	542	on volcanic ash, Alaska.....	726
white fly. (See White fly, citrus.)		hay, ash analyses, Ohio.....	861
<i>Citrus ichangensis</i> , description, U.S.D.A.....	839	v. shelled corn for sheep.....	572
<i>latipes</i> , description,		worm, notes.....	252
U.S.D.A.....	840	inoculation.....	326
<i>Cladius pectinicornis</i> , parasite of.....	359	management in corn-belt rotation.....	140
<i>Cladochytrium graminis</i> , description and		nematodes affecting.....	151, 446
treatment.....	751	pollen, physiology of.....	829
<i>Cladosporium</i> —		red, culture experiments, N.Dak.....	226
<i>herbarum</i> , notes.....	161, 243, 845	seed color in.....	533
penetration of egg shells by...	765	seeding.....	634
relation to citrus gummosis,		varieties.....	139
Fla.....	247	rotation experiments.....	227
iodin compounds.....	133	seed chalcid fly, notes.....	252
<i>laricis</i> , notes.....	156	germination and purity tests, Vt....	741
Clarendon County, S. C., soil survey,		energy of.....	538
U.S.D.A.....	16	tests.....	740
Clarksburg area, W. Va., soil survey,		serpentine leaf miner affecting, U.S.D.A...	857
U.S.D.A.....	17	silage, analyses, Can.....	270
Clay deposits in Virginia coastal plain.....	513	streak disease, notes.....	352
drainage tile, tests.....	685	sweet. (See Sweet clover.)	
effect on loamy sand.....	19	v. alfalfa in the rotation.....	634
Clemson College, notes.....	98, 399	varieties.....	830
<i>Cleonus calandroides</i> , notes.....	761	white, variation in.....	321
Climate—		varieties.....	139
as affected by forests.....	642, 842	Clubs, neighborhood improvement, notes....	95
volcanic dust, U.S.D.A.....	720	Coal tar vapors, effect on plants.....	530
effect on agriculture in Germany.....	811	Cob meal, analyses, N.J.....	666
composition of wheat.....	835	Coccaceæ in American Museum of Natural	
Wash.....	834	History.....	676
of San Francisco, U.S.D.A.....	415	Coccidæ of California.....	158
Utah.....	811	parasites of, Hawaii.....	253
relation to horticulture.....	40	<i>Coccidiascus legeri</i> n. g. and n. sp., notes...	759
plant growth.....	719	Coccidiosis in cattle, treatment.....	676
volcanoes.....	720, 721	chickens, treatment.....	889
(See also Meteorology.)		<i>Coccinella</i> spp., studies, Okla.....	355
Climatic areas of United States.....	719	<i>Coccinellidæ</i> of Philippines.....	657
Climatological summaries, U.S.D.A.....	121	<i>Coccobacillus acridiorum</i> , notes.....	354
Climatology, relation to fruit culture and agri-		<i>caje</i> , notes.....	855
culture.....	15	<i>erausquinii</i> n. sp., description....	757
(See also Meteorology.)		<i>Coccoomyces hiemalis</i> n. sp., description...	349
Clinostat, multiple, description.....	421	<i>pini</i> , notes.....	851
<i>Clostridium gelatinosum</i> , notes.....	153	<i>Coccophagus</i> spp., notes.....	654
Cloud-shadow projection, paper on, U.S.D.A.,	510	<i>Coccus hesperidum</i> . (See Scale, soft.)	

	Page.		Page.
<i>Cochylis ambiguella</i> , life history and remedies.	655	Coleoptera of British India, treatise.....	57
Cockroaches, trap for.....	653	Isles, treatise.....	358
Cocoa, examination.....	361	Colleges. (See Agricultural colleges.)	
value in the diet.....	664	Collegiate Country-Life Club for Rural Lead-	
Cocoe diseases, notes.....	345	ership.....	199
Coconut cake, analyses.....	467	<i>Colletotrichum</i> —	
for steers.....	272	agaves, description and treatment.....	346
disease, notes, P.R.....	650	<i>falcatum</i> , notes.....	348, 647
diseases, notes.....	345	<i>glauosporioides</i> , notes.....	243
treatment.....	749	relation to citrus gummo-	
fat, detection in butter.....	810	sis, Fla.....	247
industry in Philippines.....	340	<i>gossypii</i> , notes.....	548
meal, analyses.....	367	<i>lindemuthianum</i> , notes.....	150
oil, detection.....	613	<i>luxificum</i> , notes.....	155
palms, beetles affecting.....	858	<i>theobromicolum</i> , notes.....	548
insects affecting.....	53	Colloid chemistry, application to agriculture.	408
scale, notes.....	858	Colloids, importance in soils.....	817
weevil, notes.....	653	physics and chemistry of.....	608
Coconuts, culture experiments, P.R.....	637	studies.....	201
fertilizer experiments.....	746	Color, effect on radiation from soils, Mich....	619
P.R.....	637	standards in biology, book.....	762
handbook.....	840	Colorado College, notes.....	96
Cod-liver oil for calves.....	170, 668	Station, notes.....	96
Codling moth—		Colors, artificial, use in food products.....	661
control, Cal.....	558	Colostrum, catalytic activity, U.S.D.A.....	717
notes.....	353	human, antibody content.....	778
Ariz.....	453	<i>Colpoda cucullus</i> , prevalence in soils, P.R....	622
Oreg.....	158	Colts, draft, developing, Pa.....	773
parasitic and predaceous enemies of, Nev.	158	Columbia River, annual rise, U.S.D.A.....	812
remedies.....	456	Columbine, culture in Alaska, Alaska.....	743
<i>Caloides brunneri</i> n. sp., description.....	562	Comfrey, culture experiments.....	331
<i>Calophora</i> spp., life histories, Hawaii.....	253	Commodities, prices of in 1912.....	190
<i>Coelopisthoidea cladix</i> n. g. and n. sp., notes..	359	Complement fixation test, diagnostic value	
<i>Coffea arabica</i> , culture experiments, P.R.....	641	for contagious abortion in cows.....	586
longicorn beetle affecting.....	857	Concordia Parish, La., soil survey, U.S.D.A..	16
Coffee beans, fatty oil and wax of.....	811	Concrete—	
culture and manuring.....	239	arch bridges, internal temperature range.....	786
experiments, P.R.....	641	as affected by acids, oils, and fats.....	184
disease in East Africa.....	851	alkali salts and sea water..	686
diseases, notes.....	345	various substances.....	891
P.R.....	650	construction work in cold weather.....	291
fertilizer experiments, P.R.....	641	effect of too much water in mixing.....	386
formation of aromatic substances in.....	361	pipe or tile. (See Pipe and Tile.)	
improvement by selection.....	439	proportioning.....	386
insects affecting.....	653	protection against destructive agents....	386
leaf miner, notes, P.R.....	652	strength as affected by moisture.....	487
resistance to native vegetation.....	340	use in farm buildings.....	689
roasted, gases evolved from.....	265	value of washed sand and gravel in.....	183
seed, germination tests, P.R.....	642	waterproofing.....	787
silver thread blight, studies.....	351, 552	Condenser, reflux, notes.....	800
treatise.....	265	Condiments, chemistry, progress in.....	412, 506
value in the diet.....	664	methods of analysis.....	412
weevils, notes, P.R.....	652	value in the diet.....	664
Cognac. (See Brandy.)		Confectionery from vegetables.....	60
<i>Colaspidea atrum</i> , remedies.....	561	stores, inspection, N.Dak.....	661
Cold, effect on micro-organisms in soils.....	316	in Virginia..	766
storage construction, address on.....	770	Congo red, use in culture media, U.S.D.A.....	528
effect on eggs.....	276	Conifers, Japanese, seed and seedling struc-	
olives.....	340	ture.....	240
proteolytic enzymes.....	268	wood structure.....	344
injury to fruits, studies.....	135	spraying experiments, Me.....	252
notes, N.Dak.....	866	structure of tracheids.....	217
of fruits.....	745	<i>Coniophora cerebella</i> , notes.....	157
on farms.....	88	<i>Coniothyrium pirinum</i> , studies, Va.....	648
plants, inspection in Virginia... ..	567	Connecticut—	
(See also Temperature, low.)		College, notes.....	96, 195, 697

Connecticut—Continued.	Page.		Page.
State Station, financial statement.....	599	Corn culture in Hawaii, Hawaii.....	633
report.....	599	Kentucky and West Vir-	
Stations, notes.....	195	ginia, U.S.D.A.....	534
Storrs Station, notes.....	697	Texas Panhandle, U.S.D.A.....	429
<i>Conorhynchus luigionii</i> , notes and remedies..	562	manual.....	830
<i>Conostigmus rodhaini</i> n. sp., description.....	563	cutworms affecting.....	252
<i>Conotrachelus nenuphar</i> . (See Plum cur-		degerminated, analyses, Wis.....	367
culio.)		deterioration, U.S.D.A.....	7
<i>Contarinia sorghicola</i> , notes.....	252	distance experiments.....	737, 738
tritici. (See Wheat midge.)		distillery residues, effect on composi-	
Cookery books, bibliography.....	567	tion of milk.....	374
Cooking, book.....	61, 362, 464, 661, 766	ear rots, notes, Ohio.....	793
effect on milk.....	160	earworm, injurious to alfalfa.....	252
for the sick and convalescent.....	898	notes, P. R.....	652
Cooperage, treatise.....	644	effect of crossing on yield, Va.....	533
<i>Cooperia oncophora</i> in calves.....	384	on nitrate content of soils, N. Y.	
<i>Cooperia-Zephyranthes</i> hybrids, description..	341	Cornell.....	818
Copper—		Egyptian, notes.....	141
chlorid, effect on activity of malt diastase	528	evaporation of water by.....	525
oxid, effect on germination of seeds.....	528	extracts, toxicity.....	175
nitrification in soils.....	529	fertilizer experiments.....	731, 736, 737, 829
nutrition and health, U.S.		Me.....	129
D.A.....	762	N.C.....	31
salts, use against tuberculosis.....	481	Ohio.....	31, 137, 728
sprays, wetting power, increasing.....	850	U.S.D.A.....	32
sulphate, effect on cereals.....	151	floral abnormalities in.....	629
germination of cereals.....	346	U.S.D.A.....	33
utilization by <i>Aspergillus niger</i>	628	from Sudan.....	633
Copra, cost of production.....	439	germination as affected by metallic	
preparation.....	840	compounds.....	528
<i>Coprinus comatus</i> , prevalence in South Africa	461	energy of.....	538
<i>Cordyceps barberi</i> , notes, P. R.....	52	tests.....	740
Corn, analyses.....	470, 633	green, cost of distribution.....	492
and cob meal, analyses, N.J.....	666	growth as affected by meteorology...	510
oats, ground, analyses, Wis.....	367	in shade, U.S.D.A.....	130
ash analyses, Ohio.....	861	harvesting.....	534
assimilation of organic phosphates by..	423	heredity in, Nebr.....	333
billbug, life history and habits, N.C....	56	U.S.D.A.....	34
bran, analyses, Ky.....	270	improvement, N.H.....	736
N.J.....	666	in Nebraska.....	534
ash analyses, Ohio.....	861	Russia.....	534
breeding.....	633, 737	irrigation, N. Mex.....	621
experiments, Fla.....	229	experiments, U.S.D.A.....	32
brown rust, studies.....	45	leaf louse, notes.....	252
by-products, analyses.....	271	lime-magnesia requirements.....	521
chops, analyses.....	467	meal, analyses, Ky.....	270
Ky.....	270	N.J.....	666
clubs in Virginia.....	599	R.I.....	570
composition and yield as affected by		Vt.....	769
width of rows.....	533	bolted, ash analyses, Ohio.....	861
cost of production, N.Dak.....	690	relation to pellagra.....	768
cracked, analyses.....	467	Mendelian chemical characters in.....	830
Ky.....	270	molds, notes, Ohio.....	793
cross pollination experiments, U.S.		mosaic coherence of characters in, U.S.	
D.A.....	229	D.A.....	633
crushed ear, analyses, Ky.....	270	nutritive value and use in the diet, U.S.	
culture.....	229, 395, 830	D.A.....	864
Md.....	193	oil, detection.....	613
U.S.D.A.....	335	hydrogenation.....	459
experiments.....	738, 830	planting various parts of ear, N.C.....	31
Can.....	223	preservation.....	312
Mont.....	630	products, analyses, Wis.....	367
N.Dak.....	226, 425	proteins, nutritive value.....	62
N.H.....	736	refuse, nutritive value.....	665
Nebr.....	225, 736	relation to pellagra.....	175
U.S.D.A.....	137	root aphid, notes.....	252
in Bessarabia.....	335	worm, northern, notes.....	252

	Page.		Page.
Corn, seed, handling and planting.....	335	Cotton—Continued.	
maggot, notes, U.S.D.A.....	454	culture in South Africa.....	430
selection, Nebr.....	736	the Southwest, U.S.D.A.....	634
situation, review.....	634	on Yuma reclamation project, U.	
testing.....	899	S.D.A.....	226
seeding experiments, Can.....	224	curley leaf, cause and treatment.....	751
Nebr.....	225	diseases, notes.....	548, 749
shelled, <i>v.</i> clover hay for sheep.....	572	distance experiments, Miss.....	35
silage. (<i>See</i> Silage.)		Durango, culture, U.S.D.A.....	36
sirup, standards for.....	867	Egyptian, culture in the Southwest, U. S.	
stalk borer, notes.....	356, 453	D.A.....	140
stalks, formation of sugar in.....	409	production and marketing....	596
starch, relation to polyneuritis.....	460	electrical response in.....	27
stover, ash analyses, Ohio.....	861	fertilizer experiments.....	736
suckers, economic value, N.C.....	31, 35	Ala. College.....	335, 336
transformation of nitrogen by.....	133	Fla.....	224
variation in, due to fertilizers.....	435	Miss.....	35
varieties.....	335, 530, 737	N.C.....	31
Ariz.....	426	U.S.D.A.....	32
Can.....	222	fibers, strength of, U.S.D.A.....	312
Nebr.....	225, 736	ginning experiments, Hawaii.....	224
Nev.....	138	growers' organization, notes.....	894
Ohio.....	31, 137	growth in shade, U.S.D.A.....	130
P.R.....	631	handling and marketing, U.S.D.A.....	430
U.S.D.A.....	32, 330, 429	insects affecting.....	653, 756
water requirements, U.S.D.A.....	826	leaf caterpillar, outbreak in Peru.....	356
wireworms affecting.....	858	cut or tomosis, notes, U.S.D.A.....	47
Me.....	252	liming experiments.....	430
yield per acre unit <i>v.</i> score card for.....	633	long-staple, factors affecting production,	
yields, U.S.D.A.....	32	U.S.D.A.....	140
Cornell University, notes.....	98, 196, 398, 699	marketing.....	894
Corpus luteum extracts, effect on cows.....	578	moths, notes.....	456
Corrosive sublimate, absorption by potatoes,		native wild, notes, Ariz.....	441
Can.....	242	propagation experiments, U.S.D.A.....	330
<i>Corticium salmonicolor</i> , notes.....	547, 749	red spider, notes, U.S.D.A.....	360
treatment.....	552	root rot, notes.....	445
<i>vagum solani</i> , notes.....	647	rust, prevention, Miss.....	35
treatment, Can.....	242	seed, as affected by storage, U.S.D.A.....	140
<i>Corynebacterium piriforme</i> , description.....	345	cake, analyses, Wis.....	367
<i>Coryneum modonium</i> , notes.....	156	for cows.....	577
Cost of living, factors affecting.....	595, 867	sheep and steers.....	169
in Australia.....	362, 393	<i>v.</i> soy bean cake for cows.....	172
Bavaria.....	295	fertilizing value, Ala. College.....	831
New Zealand.....	295, 362	improving quality of.....	738
United Kingdom.....	766	seed meal—	
reduction.....	463	analyses.....	271, 467
relation to railroad rates.....	594	Can.....	270
Cotton—		Ky.....	270
anthracnose, description and treatment,		N.H.....	769
U.S.D.A.....	751	N.J.....	665
aphis, studies, Okla.....	355	R.I.....	570
boll soft rot, cause.....	749	Vt.....	769
weevil, control in Sumatra.....	853	Wis.....	367
notes.....	562	and hulls, analyses, N.J.....	666
Fla.....	251	ash analyses, Ohio.....	861
quarantine in Tennessee.....	653	feeding, N.C.....	76
wild host plant of.....	458	fertilizing value, Ala. College.....	335, 336, 831
bollworm, notes.....	456	phosphorus compounds in, Tex.....	804
pink, notes, Hawaii.....	253	rations for steers, Tenn.....	667
breeding experiments, N. C.....	31	toxicity.....	477
culture experiments.....	830	N.C.....	76
in British India.....	534	<i>v.</i> velvet beans for cows, Fla.....	576
Burma.....	736	seed oil, detection.....	613, 798
Cape of Good Hope.....	738	for calves.....	170, 668
Egypt.....	431	hydrogenation.....	413, 459
India.....	431, 634, 736	self-pollination in, U.S.D.A.....	36
Louisiana, U.S.D.A.....	534	serpentine leaf miner affecting, U.S.D.A.....	857
		square-weevil, studies.....	685

Cotton—Continued.	Page.		Page.
stainer, muscoid parasites of.....	358	Cows, fish meal for.....	270
topping experiments, Miss.....	35	judging.....	577, 673
treatise.....	738	milking trials.....	373, 375
varieties.....	430, 534, 738, 830	records. (See Dairy herd records.)	
Ariz.....	426	relation of body weights to production.	374
Miss.....	35	escutcheon to milk flow, Vt.....	775
N.C.....	31	form and function.....	473
U.S.D.A.....	32	selection and feeding.....	577
weevils, notes.....	562	tuberculous, relation to human health.....	382
white scale in Peru.....	654	udder flora of, N.Y.State.....	279
wilt, notes.....	446	value of official records, Cal.....	71
yields, U.S.D.A.....	32	winter fodder for.....	577
Cottony cushion scale, notes.....	654	Cratægus seeds, after-ripening studies.....	527
<i>Cotyledon orbiculata</i> , toxicity.....	476	<i>Cratopus punctum</i> , notes.....	858
Couch grass, monograph.....	141	Cream buying, permit system, Kans.....	879
Country homes, planning.....	186	care of.....	673, 777
life advancement, New York State		Ohio.....	674
advisory board.....	99	on the farm.....	463
County experiment farm law, Ohio.....	899	Nebr.....	71
Cover crops for orchards.....	395	cooling without ice, U.S.D.A.....	696
Nev.....	147	factors affecting churnability.....	579
Cow manure ashes, fertilizing value.....	228	fat content, Wash....	879
effect on availability of potash		grading in Alberta.....	375
in soils.....	796	homogenizing experiments.....	879
nitrification, N.C.....	21	paying for at creameries.....	375
testing association, high school, notes...	299	sampling and testing, Kans.....	879
associations, formation, N.Y.		separators, descriptions.....	390
Cornell.....	578	tests.....	88, 390
in Canada.....	673	standards, U.S.D.A.....	777
notes, Md.....	375	testing.....	876
and bibliog-		Mo.....	879
raphy.....	375	Creameries—	
Cowpea hay, ash analyses, Ohio.....	861	cooperative, organization and manage-	
v. alfalfa hay for dairy cows,		ment, Mont.....	674
Okla.....	876	expense items in.....	375
root rot, notes.....	445	in Norway.....	897
wilt, notes.....	444	inspection in Virginia.....	766
Cowpeas—		use of fuel in.....	88
analyses.....	271	water supply for.....	474
ash analyses, Ohio.....	861	Creamery practice, compilation of articles on.	777
culture experiments.....	830	in Virginia.....	473
in Porto Rico, P.R.....	631	problems, Kans.....	879
fertilizer experiments.....	829	Creatin, determination in meat products....	800
nutritive value and use in the diet,		Creatinin, determination in meat products...	800
U.S.D.A.....	864	Creosoted wood, disappearance of phenols	
origin, U.S.D.A.....	229	from.....	111
serpentine leaf miner affecting, U.S.D.A.	857	<i>Crepidotus</i> sp. (?), notes.....	152
varieties, N.C.....	31	Cress, induced semiparasitism in.....	629
Cows as affected by extracts of pituitary body		Crimson clover. (See Clover, crimson.)	
and corpus luteum.....	578	<i>Criocephalus rusticus</i> injurious to timber....	858
Ayrshire, relation between amount and		<i>Crioceris duodecimpunctata</i> , studies and bibli-	
composition of milk produced.....	876	ography, N.Y.Cornell.....	556
breeding for high production.....	375	<i>Cronartium ribicola</i> , notes, Conn.State.....	547
care and management, Ohio.....	775	and treatment....	249
Okla.....	876	outbreak on currants....	649
effect of fetal growth on milk produc-		Crop production, relation to meteorology....	314
tion.....	577	soil variation.....	416
feeding.....	473, 577	reports, U.S.D.A.....	190, 296, 896
Ky.....	276	rotations. (See Rotation of crops.)	
Minn.....	575	safety on mountain slopes, U.S.D.A.....	414
experiments. 172, 277, 373, 374, 475, 774		yields, relation to available plant food in	
Can.....	775	soils, Va.....	623
Fla.....	576	zones of New Mexico, U.S.D.A.....	755
Kans.....	575	Cropping, effect on soil moisture, N.Dak..	211, 425
Ky.....	277	Crops, culture in Brazil.....	428
for milk production.....	577	harvested, analyses.....	119

	Page.		Page.
Cross pollination, effect on plants, Md.....	339	Cytoplasm, rôle in heredity.....	66
<i>Crotalaria striata</i> , analyses.....	215	<i>Dacus</i> n. spp., descriptions.....	359
Crowdy for cows.....	172	<i>Dacus ferrugineus</i> , notes.....	453
Crown gall of fruit trees, notes.....	348	Dahlia, notes.....	341
studies.....	45	treatise.....	441
Crude fiber. (See Cellulose.).....		Dairies, inspection in Ohio.....	266
<i>Cryptococcus anseris</i> , description.....	83	Virginia.....	567, 766
<i>Cryptotæmus montrouzieri</i> , notes, P.R.....	652	steam pipes in.....	893
<i>Cryptomeigenia aurifacies</i> , notes, P.R.....	52	Dairy barns, ventilation.....	474
sp., notes, P.R.....	652	buildings, notes, Okla.....	876
<i>Cryptosporella viticola</i> , studies.....	450	farming in New Hampshire, U.S.D.A.....	391
<i>Cryptothrips floridensis</i> n. sp., notes.....	354	farms, water supplies for.....	722
<i>Ctenocephalus canis</i> , distribution on rats.....	755	herd improvement, Ohio.....	775
<i>Ctenosyllus musculi</i> , distribution on rats.....	755	records.....	278, 375, 475
<i>Ctenucha virginica</i> , notes, Me.....	251	Can.....	278
Cucumber beetle, notes, P.R.....	652	Fla.....	272, 577
canker, notes.....	847	Mass.....	876
disease, new, description, Fla.....	242	Md.....	375
leaf spot, description and treat- ment.....	48	U.S.D.A.....	70
wilt, notes.....	245	herds, testing and grading.....	280
Cucumbers, culture, Mich.....	145	inspection, paper on.....	500
<i>Cucurbitacea acanthosicyos horrida</i> , descrip- tion.....	60	Institute at Alnap.....	172
<i>Culex quinquefasciatus (fatigans)</i> , studies, Hawaii.....	252	instruction in various countries.....	191
Culicidae. (See Mosquitoes.).....		law in Illinois.....	61
Cultivation, effect on composition of soils... 416, 417		losses, detection, Cal.....	71
handbook.....	329	operations, effect on germ content of milk, N.Y.State.....	878
Cultivators, tests.....	186	organization, paper on.....	894
Cumulus clouds, violent uprushes in, U.S.D.A.....	120	products, analyses.....	119
Curb, concrete caisson, for shallow wells, Ariz.....	484	inspection in Michigan.....	463
Currant felt rust, notes and treatment.....	249	Pennsylvania.....	867
juice, composition as affected by fer- tilizers.....	838	Washington.....	266
maggot, notes, Oreg.....	158	Wisconsin.....	61
Currants, black, pine rust of, Conn. State.....	547	law in Michigan.....	61
destruction by <i>Cronartium ribicola</i>	649	marketing.....	894
new, descriptions, N.Y. State.....	838	standards in United States, U.S.D.A.....	776
Cutworm, variegated, notes.....	252	profits, increasing, Cal.....	71
Cutworms injurious to alfalfa, Nev.....	158	sanitation, notes, Wash.....	878
tobacco.....	756	technology, progress in 1912.....	805
notes.....	759	terminology, notes.....	172
Can.....	252	Dairying, handbook.....	775
Mont.....	652	in Canada.....	673, 775
N.J.....	653	North Dakota.....	473
Cyanamid, handbook.....	518	Oklahoma, Okla.....	876
injurious to fish.....	821	Scotland.....	473
manufacture and uses.....	24	semiarid sections, U.S.D.A.....	473
paper on.....	517	Virginia.....	473
studies.....	127	laboratory guide.....	93
Cyanogenesis, review of investigations.....	713	notes.....	375
<i>Cylocephala villosa</i> , notes.....	252	Dale County, Ala., soil survey, U.S.D.A.....	16
<i>Cylicostoma mettami</i> n. sp., notes.....	889	Dams, earth, treatise.....	289
<i>Cylindrosporium</i> on <i>Prunus avium</i> , perfect stage.....	349	Darkling beetle grubs injurious to tobacco.....	761
<i>Cylindrosporium pomi</i> , notes, Conn. State.....	547	Dashens, culture experiments, P.R.....	637
<i>Cyperus edulis</i> , notes.....	362	in Louisiana, U.S.D.A.....	534
esculentus, description.....	59	fertilizer experiments, P.R.....	637
Cypress, Alaska, biennial fructification, U.S. D.A.....	543	notes and analyses, U.S.D.A.....	336
twig tuberculosis, notes.....	651	recipes, U.S.D.A.....	361
<i>Cysticercus cellulose</i> , hosts of.....	586	varieties, P.R.....	637
ovis, investigations, U.S.D.A.....	886	<i>Dasytiron</i> spp., notes, Ariz.....	441
<i>Cystopus candidus</i> , notes.....	245	<i>Dasytus novemcinctus texanus</i> , biology and habits.....	755
<i>Cytisus scorparius</i> , notes, Ariz.....	441	<i>Datana integerrima</i> , egg parasites of.....	658
		Date-palm sugar industry in Bengal.....	149
		palms, false, of Florida Keys.....	341
		Dates, artificial ripening studies, Ariz.....	439
		ash analyses, Ohio.....	861

	Page.		Page.
Dates, culture experiments, U.S.D.A.....	338	Diet and foods, treatise.....	267, 661
in Salt River Valley, Ariz.....	439	value of seasoning in.....	663
the Southwest, U.S.D.A.....	542	(See also Food.)	
dried, preparation and use, U.S.D.A.....	462	Dietary, importance in higher education....	464
pasteurizing, Ariz.....	439	ration tables, use.....	463
Deer breeding, treatise.....	171	studies, Ohio.....	861
chromatin bodies in erythrocytes of....	478	in Paris.....	463
Delaware College, notes.....	195, 697	Dietetics, calculating energy values in.....	166
Station, financial statement.....	793	treatise and bibliography.....	163
notes.....	195	Digestion as affected by sugar.....	663
report of director.....	793	experiments with man.....	865
<i>Delphaz saccharivora</i> , notes, P.R.....	52	products, methods of examining... ..	408
Denaturants, detection in ethyl alcohol.....	312	passage from mother to	
Denitrification in Nebraska soils.....	734	fetus.....	665
plants, studies.....	326	Digestive tract, periodic work of.....	465
soils.....	817	Dika fat, detection.....	613
Dental decay, relation to foods.....	364	<i>Dinoderus brevis</i> , notes.....	458
Department of Agriculture. (See United		<i>Diplocarpon rosæ</i> , notes, Ala.College.....	552
States Department of Agriculture.)		Diplochia, inoculation experiments, Fla.....	248
<i>Depressaria heracliana</i> destructive to parsnips.	855	<i>Diplochia natalensis</i> , relation to citrus gum-	
<i>Dermacenter</i> —		mosis, Fla.....	247
<i>andersoni</i> , control in Bitter Root Valley..	658	sp., notes.....	548
<i>nitens</i> , relation to equine piroplasmosis..	83, 483	Dipping tanks, construction.....	87, 585
spp., life histories.....	861	vats, construction, Ala.College.....	585
<i>venustus</i> , inflammation following bite of..	585	Dips, effect on animals.....	585
relation to paralysis in lambs..	482	<i>Dipsacus fullonum</i> , description and culture..	142
Dermitis, pustular, in horses.....	179	Diptera, blood sucking—	
Dewberry rusts, notes and treatment, N.C....	50	mouth parts and sucking ap-	
Dextrose in Fucoideæ.....	566	paratus of.....	760
Dhaura, notes.....	443	of Brazil.....	54
Diabetic foods, analyses, Conn.State.....	660	coprophagous, biology.....	760
<i>Diabrotica graminea</i> , notes, P.R.....	53	leaf-mining, ichneumon parasites of..	359
<i>longicornis</i> , notes.....	252	Disaccharids, resorption in small intestine..	268
spp., notes, P.R.....	652	Diseases, bibliography.....	652
Diagnostics, biologic inconsistencies of.....	500	of animals. (See Animal diseases.)	
Diamalt, value in bread making.....	765	plants. (See Plant diseases.)	
<i>Diaphania nitidalis</i> . (See Pickle worm.)		transmission by insects.....	756
<i>Diaporthe batatatis</i> n. sp., investigations, U.S.		Disinfectants—	
D.A.....	153	action of.....	802
<i>parasitica</i> , studies.....	156	bacteriological standardization, N.Dak..	803
Diarrhea, chronic, in cattle.....	284, 587	international test for.....	802
white, in chicks, Conn.Storrs.....	288	notes, Cal.....	77
<i>Diaspis pentagona</i> , remedies.....	854	so-called, notes, N.Dak.....	866
Diastase, occurrence in red algæ.....	220	<i>Disonycha</i> spp., notes, Can.....	761
value in bread making.....	765	U.S.D.A.....	456
Diastatic activity as affected by filtration... ..	505	<i>Disphinctus</i> sp., notes.....	853
Diatomaceous earth deposits in Virginia		Distemper, canine or dog. (See Dog dis-	
coastal plain.....	513	temper.)	
<i>Diatraea saccharalis</i> . (See Sugar cane borer.)		Distilleries, fermentation processes in.....	509
spp., notes.....	353	Distillers' grains—	
<i>Diaulinus begini</i> , notes, U.S.D.A.....	857	analyses, N.H.....	769
<i>Dicaesticus gerstaeckeri</i> , notes.....	853	Wis.....	367
<i>Dichocrois punctiferalis</i> , habits and remedies.	759	ash analyses, Ohio.....	861
<i>Dictyna volupis</i> , notes, Me.....	256	dried, analyses, Ky.....	270
Dicyandiamid, studies.....	127	N.J.....	666
<i>Didea fasciata fuscipes</i> , life history.....	456	Vt.....	769
Diet and foods, text-book.....	360	screenings in, Ky.....	271
hygiene in schools, treatise.....	363	Distillery slop, dried, methods of analysis... ..	311
calcium-magnesium ratio in.....	565	effect on acidity of milk.....	579
deficiency, relation to animal diseases... ..	66	waste, effect on composition of	
effect on growth.....	164	milk.....	374, 776
of laborers and mechanics in Spain.....	365	Distomiasis in sheep, treatment.....	676
in Glasgow.....	464	Dodder, destruction by calcium cyanamid... ..	561
relation between mineral elements and		Dog distemper, cause.....	682
protein content.....	64	rose leaves, formaldehyde in.....	308
to beriberi.....	180	Dogs, Airedale, prepotency in.....	770
rickets.....	464	metabolism experiments.....	165, 567
		parathyroid glands of.....	377

	Page.		Page.
Dogs, relation to tapeworms in sheep, U.S.D.A.	887	Durra, culture in Texas Panhandle, U.S.D.A.	430
viability of cysticerci in.	482	Sudan, for dairy cows.	374
Domestic art or science. (See Home eco- nomics.)		yields, U.S.D.A.	32
Dough, fermentation cabinet for, Minn.	263	Durum wheat. (See Wheat, durum.)	
sour, fermentation.	60	Dust prevention experiments, U.S.D.A.	590
Dourine, immunity to.	379	Duty of water. (See Water, duty.)	
in European Russia.	479	Dwellings, fumigation, Ky.	640
Drainage—		Dye plants of Iowa.	626
convention at Raleigh, North Carolina.	182	Dyes, fat-soluble, effect on tuberculous guinea pigs.	177
ditches, spacing in meadows.	331	subsidiary, determination in food col- ors, U.S.D.A.	11
engineers, need of.	182	use in food-coloring agents.	661
experiments in Belgium.	785	Dyestuffs, identification, U.S.D.A.	12
Prussia.	426	Dynamite as a soil improver, Hawaii.	748
in Nebraska.	289	planting trees with.	339
New South Wales.	785	use in drainage.	182
North Dakota.	182	Dynos and motors, treatise.	892
Wisconsin.	589	<i>Dysdercus ruficollis</i> , parasite of.	358
notes.	85	<i>suturellus</i> . (See Cotton stainer.)	
and bibliography, Vt.	785	Dysentery, chronic bacterial. (See Johnes disease.)	
of Haarlem Lake, Holland.	182	Earflies, notes, U.S.D.A.	454
irrigation soils in Egypt.	684, 816	<i>Earias chlorana</i> , notes.	853
pumping plant for.	785	East coast fever. (See African coast fever.)	
tile. (See Tile.)		Ecology, bibliography.	626
use of dynamite in.	182	Economic survey in southern Minnesota.	489
Dried blood, effect on tomatoes, Md.	339	Economics, rural. (See Rural economics.)	
fertilizing value.	129	<i>Ecthetopyga gossypii</i> n. g. and n. sp., notes.	562
for carnations and roses.	840	<i>Ectoedemia castaneæ</i> n. sp., description.	758
loss from soils, Fla.	211	Eczema in horses and bovines.	378
production and use.	517	Education—	
<i>Drosicha lichenoides</i> n. sp., description.	255	agricultural. (See Agricultural educa- tion.)	
<i>Drosophila ampelophila</i> . (See Pomace fly.)		vocational, legislation for State system.	596
Drought in Louisiana, U.S.D.A.	812	Educational institutions, effect on develop- ment of agricultural science.	191
Meramec, Arkansas, and Red		Egg albumin. (See Albumin, egg.)	
River basins, U.S.D.A.	812	industry in United States, U.S.D.A.	774
New York, U.S.D.A.	812	laying contest at Connecticut Storrs Sta- tion.	70
Drug law in Louisiana.	566	contests in Australia.	275, 472, 672
Michigan.	61	notes, U.S.D.A.	696
South Dakota.	566	pastes, judging.	564
laws, treatise.	266	preservative, commercial, analyses, N. Dak.	661
product, analyses, N.Dak.	866	production, breeding for.	472, 874
Drugs, effect on polyneuritis.	568	U.S.D.A.	696
inspection, N.Dak.	661, 865	yolks, denaturing.	564
Nev.	266	lecithin of.	503
in Florida.	567, 766	preservation and use.	564
Idaho.	867	Eggplants, irrigation experiments, P.R.	638
Michigan.	463	Eggs, ash analyses, Ohio.	861
Missouri.	362	cost of distribution.	492
North Carolina.	266	decomposition.	765
Ohio.	266	deterioration, U.S.D.A.	276
Texas.	61	double-yolked, origin.	69
Washington.	266	evaporation in cold storage.	276
Dry farming experiments, Ariz.	426	fertile, immunity against bacterial in- fection.	159
Hawaii.	224	fertility experiments.	574
U.S.D.A.	31	improving quality of, U.S.D.A.	472
in the Southwest, Ariz.	735	increasing size of.	574
matter, determination in root crops.	310, 809	incubation experiments.	275
Dschamma, notes.	362	judging.	395
Ducks, egg laying capacity of various breeds.	672	marketing, Minn.	875
hybrid, sterility in.	167	in Ontario.	70
Indian Runner, breeding and care.	574		
metabolism experiments.	171		
wild, food supply for.	373		
Dumraon Agricultural Experimental Station, report.	228		
Duodenum, activity of ferments in.	268		

	Page.
Engines, internal combustion—	
description.....	592
jacket water requirements.....	292
oils for.....	892
treatise.....	184
service tests.....	892
steam, for sun-power plants....	787
Entkang tallow, detection.....	631
Entamebæ, photomicrographs of.....	478
Enteritis, chronic. (See John's disease.)	
Enterohepatitis, infectious. (See Blackhead.)	
Enterokinase, effect on generation of trypsin.	662
Entomological collections for common schools.	395
Entomology, economic, in South Africa.....	756
forest, text-book.....	853
treatise.....	555
Environment, effect on composition of	
wheat.....	263
Enzym action, reversibility.....	505, 506
studies.....	713
Enzymes, determination in sputum.....	782
diastatic, hydrolysis of—	
glycogen by.....	166
phosphorus compounds by.....	166
proteolytic, as affected by—	
phosphates.....	309
salt and cold storage.....	268
relation to citrus diseases, Fla.....	248
(See also Ferments.)	
<i>Ephesia elutella</i> , notes.....	54
<i>kuehniella</i> . (See Mediterranean	
flour moth.)	
<i>Epilachna corrupta</i> , notes, Ariz.....	453
<i>rigentictopunctata</i> , notes.....	453
<i>Epinotia piceafoliana</i> , notes, Me.....	256
Epiphanin reaction, notes.....	881, 882
<i>Epirix cucumeris</i> , notes, Can.....	761
studies and bibliography,	
Me.....	258
<i>Equisetum arvense</i> , poisoning of horses by,	
Can.....	281
<i>Eragrostis abyssinica</i> , culture, P. R.....	631
Ere beans, culture experiments.....	830
Erie County, Pa., soil survey, U.S.D.A.....	16
<i>Eriocampoides limacina</i> . (See Pear-slug.)	
<i>Eriopeltis coloradensis</i> , notes.....	252
<i>Eriopus floridensis</i> , studies, U.S.D.A.....	854
<i>Eristalis æneus</i> , life history.....	456
Erysipelas, immunization.....	176
<i>Erysiphe communis</i> , notes.....	243
<i>graminis</i> , susceptibility of wheat to.	844
<i>polygoni</i> , notes.....	450, 650
Escutcheon, value in judging cattle, Vt.....	775
Essential oils. (See Oils, essential.)	
Esters, fatty acid, of glucose.....	269
unsaponifiable, absorption in the in-	
testine.....	768
Ether, detection in ethyl alcohol.....	312
extract of soils, Tex.....	801
Ethereal oils in spruce wood.....	504
Ethyl alcohol adulteration, detection.....	312
effect on synthetic action of	
emulsin.....	505
methods of analysis.....	312
Ethylene, detection.....	529

	Page.		Page.
Ethylene gas, detection with sweet pea seedlings.....	132	Farm equipment, care of.....	595
Eucalypts, growth on overflow land, U.S.D.A.....	338	homes, management.....	465
varieties, P.R.....	638	houses, fireproof, construction.....	689
<i>Eucalyptus globulus</i> plantations of Nilgiris.....	443	planning.....	186
<i>pulverulenta</i> , leaf spot of.....	156	laborers. (See Agricultural laborers.)	
Eucalyptus posts, preservation.....	443	life, reading course in.....	598
<i>Eucelatoria australis</i> , notes.....	357	machinery. (See Agricultural machinery.)	
<i>Eulea indetermina</i> , notes, U.S.D.A.....	855	management in central Germany.....	170
<i>Eudamus proteus</i> . (See Bean leaf-roller.)		Silesia.....	89
<i>Eulecanium corni</i> , notes, Me.....	251	studies.....	391
<i>nigrofasciatum</i> . (See Terrapin scale.)		managers, training.....	92
Euphorbia latex, chemical constitution.....	30	manures, treatise.....	820
systematic position of genus.....	30	mechanics and drawing, high-school course.....	192
<i>Euproctis chrysorrhæa</i> . (See Brown-tail moth.)		products. (See Agricultural products.)	
<i>Eurytoma pyrrhocerus</i> n. sp., description.....	562	school on Long Island.....	200
<i>Euthrips pyri</i> . (See Pear thrips.)		Farmers—	
<i>tritici</i> . (See Flower thrips.)		banks, cooperative.....	294
<i>Eutocchia fullo</i> , notes.....	858	cooperative company in Indiana.....	294
<i>Euvanesa antiopa</i> , notes, Me.....	251	income of, U.S.D.A.....	689
<i>Euxoa ridingsiana</i> , notes, Nev.....	158	institutes in Illinois.....	95
Evaporation—		United States, U.S.D.A.....	898
as affected by forests.....	842	interest paid by, U.S.D.A.....	186
volcanic haze.....	721	Jewish, cooperation among.....	894
at different levels above soil surfaces.....	615	list of books for.....	299
from soils.....	125, 615	selling agencies.....	294, 804
water surfaces.....	615	State loans to.....	90, 691
Nebr.....	225	Farming, manual.....	293
in marshes.....	615	relation to meteorology.....	314
relation to plant distribution.....	826	village communities in.....	789
Evergreen damping off and sun scorch, notes, Conn.State.....	547	(See also Agriculture.)	
Evergreens as affected by soils.....	513	Farms, cold storage on.....	88
Evolution, biological principles.....	67	cost accounting on.....	690
heterozygosis in.....	31	county demonstration, in Nebraska.....	633
treatise.....	665	crop exhibits for, Minn.....	93
<i>Ezoascus theobromæ</i> , notes.....	155	disinfection on, Cal.....	77
<i>Ezobasidium reticulatum</i> n. sp., description.....	450	profitable and unprofitable in New Hampshire, U.S.D.A.....	391
sp., notes.....	446	small, developing in Georgia.....	594
<i>Ezochomus constrictus</i> , studies, Okla.....	355	use of electricity on.....	184
Experiment stations—		waste on.....	595
administrative management.....	401	water supplies for.....	722
and United States Department of Agriculture, relationship.....	604	U.S.D.A.....	696
in Austria, reports.....	119	Fasting, effect on growth.....	869
United States, statistics, U.S.D.A.....	897	utilization of proteins.....	268
(See also Alabama, Alaska, etc.)		studies.....	664
Experimental field in Josephsdorf.....	290	Fat chemistry, progress in 1911.....	108
Explosives, use in agriculture.....	183, 785	determination.....	309
Extension work. (See Agricultural colleges and Agricultural extension work.)		in cheese.....	311
Extraction apparatus, notes.....	800	cream and cream products.....	798
Eye worms in chickens, notes, Hawaii.....	784	evaporated milk.....	507
Fairs, county school, in Virginia.....	599	feeding stuffs.....	800
Fallowing, effect on soil moisture, N.Dak.....	211, 425	milk powder.....	311, 507
experiments, Ariz.....	735	digestion in infants.....	365
Farcy. (See Glanders.)		globules, casings of.....	806
Farm accounting, text-book.....	792	determination in milk.....	579
accounts, keeping.....	293, 633, 690, 691	in milk, studies.....	579
advisers in Missouri, Mo.....	899	stains, transmission to offspring.....	177
animals. (See Live stock and Animals.)		utilization in the animal body.....	368
buildings, handbook.....	186, 689	Fats, absorption in the intestine.....	768
bureau in Chautauqua County, New York.....	692	chemical technology of.....	413
demonstration, editorial on.....	701	effect on concrete.....	184
in New Jersey, N.J.....	599	pancreatic secretion.....	465
		formation in oleaginous fruits.....	201
		function of in nutrition.....	868

	Page.		Page.
Fats, laboratory handbook.....	811	Fermentation—	
vegetable, bromin absorption by.....	612	alcoholic, monograph and bibliography..	714
isolation.....	459	bacterial, in cereals.....	269
of India.....	413	chemistry, progress in 1911.....	107
Fatty acids. (<i>See Acids.</i>)		of bread, studies.....	864
Fauna of German colonies.....	653	processes in breweries, distilleries, and	
Hawaii, treatise.....	250	yeast factories, treatise.....	509
Feces, chemistry of.....	568	products, use in animal feeding.....	665
of male bovines, apparatus for collec-		Ferments, determination.....	408
tion.....	408	duodenal, activity of.....	268
Feeders, automatic, for pigs.....	671	pancreatic.....	662
Feeding experiments, error in.....	169, 170	(<i>See also Enzyms.</i>)	
(<i>See also Cows, Pigs, etc.</i>)		Fern caterpillar, Florida, studies, U.S.D.A...	854
problems, discussion.....	170, 665	rusts, hosts of.....	645
Feeding stuffs—		tree trunks, analyses, Hawaii.....	270
adulteration, detection.....	311	Ferrous sulphate, effect on germination of	
analyses.....	119, 271, 367, 467	seeds.....	828
Can.....	270	Fertilization, theory of.....	167
N.J.....	665	Fertilizer—	
R.I.....	570	experiments in Prussia.....	426
ash analyses, Ohio.....	861	the Northwest.....	821
by-product, analyses and digestibility,		notes.....	213
Md.....	366	(<i>See also special crops.</i>)	
comparison.....	170	industry in the United States, future of..	821
compensation for, under tenancy.....	420	law in Missouri, Mo.....	626
condimental, law in Illinois.....	61	materials, definitions.....	517
definitions.....	367	in United States.....	517
direct transfer of, in ruminants.....	66	new mineral, tests, Me.....	129
effect on composition of milk.....	776	requirements of soils. (<i>See Soils.</i>)	
fertility in live stock.....	170	Fertilizers—	
quality of cheese.....	173	adaptation to crops and soils.....	821
size of milk fat globules.....	579	after effect.....	729
fertilizing value, Vt.....	769	analyses.....	119, 320, 521, 522, 729
inspection and analyses, Ky.....	270	R.I.....	626
N.H.....	769	effect on apples, Pa.....	438
Vt.....	769	beets.....	332
Wis.....	367	composition of currant juice....	838
in Florida.....	567	rice, Hawaii.....	231
Virginia.....	766	fish.....	821
judging.....	367	germination of seeds.....	327
law in Florida.....	869	keeping quality of pears.....	640
Kansas, Kans.....	666	oats.....	151
New Hampshire, N.H.....	769	plant food in soils, Va.....	623
New Jersey, N.J.....	665	growth.....	329
South Dakota.....	567	root development.....	328
legislation concerning.....	266	set of fruit in peaches.....	40
leguminous, analyses.....	569	soil acidity, Fla.....	237
low-grade, discussion, Vt.....	769	tomatoes, Md.....	339
methods of analysis.....	311	variation in corn and beans....	435
mixed, analyses.....	467	feldspathic, as sources of potash.....	796
R.I.....	570	for hay and pastures.....	517
notes, Okla.....	876	hops, Oreg.....	534
nutritive value.....	170	moor lands.....	516
proprietary, analyses.....	271	truck crops, treatise.....	837
Wis.....	367	handbook.....	193, 517
registered, Wis.....	367	home mixing.....	521
relation to animal diseases.....	66	imports into New Zealand.....	729
utilization by zebus.....	69	inspection and analyses, Kans.....	823
(<i>See also specific kinds.</i>)		Ky.....	823
Feeds. (<i>See Feeding stuffs.</i>)		Mo.....	420
Feldspar as a source of potash.....	215, 518	R.I.....	823
silica and alumina.....	518	S.C.....	731
use in fixation of atmospheric nitro-		Vt.....	731
gen.....	518	W.Va.....	731
Fence posts, preservation.....	443	Wis.....	420
Fennel, floral anomalies in.....	629	in Alabama.....	521
Fenugreek seed, germination energy of.....	538	Florida.....	320

	Page.		Page.
Fertilizers—Continued.		Fish, preservation.....	566, 659
inspection in Indiana, Ind.....	626	scrap, analyses.....	318
Maryland.....	522	methods of analysis.....	318
North Carolina.....	320, 522	Flax, breeding experiments.....	634
Ohio.....	522	by-products, analyses, Can.....	270
loss from soils, Fla.....	211	digestibility, Md.....	367
nitrogenous. (<i>See</i> Nitrogenous fertilizers.)		culture experiments.....	427, 431
Phosphatic. (<i>See</i> Phosphates.)		Mont.....	630
potash. (<i>See</i> Potash.)		on new lands, Mont.....	634
production and use in the South.....	213	fertilizer experiments.....	318, 625
in Germany in 1912.....	128	hybrids, correlation studies.....	424
Japan.....	729	improvement in Russia.....	534
purchasing.....	213	irrigation experiments, U.S.D.A.....	32
radio-active, tests.....	731	meal, analyses.....	367
registered, Wis.....	367	screenings, ground, analyses, N.J.....	666
relation to dry spot of cereals.....	46	seeding experiments, Can.....	224
soil fertility.....	213	N.Dak.....	425
review of investigations.....	821	varieties.....	530
sampling.....	517	Can.....	222
use in corn belt, Ill.....	623	Mont.....	630
Japan.....	729	N.Dak.....	225, 425
pond culture.....	731	Flaxseed meal, analyses.....	467
yearbook.....	213	N.H.....	769
(<i>See also specific materials.</i>)		Flea beetle, yellow-necked, notes, U.S.D.A.....	456
Fescue, Wakemann, culture in New Zealand.....	428	beetles, notes, Can.....	761
Feterita, notes, U.S.D.A.....	141	Fleas, bionomics of.....	756
Fiber, crude. (<i>See</i> Cellulose.)		rat. (<i>See</i> Rat fleas.)	
plants, culture experiments.....	538	Flies, blood sucking, relation to diseases.....	760
Fibers, textile plant, strength of, U.S.D.A.....	312	coprophagous, biology.....	760
Fibrinogen, determination.....	408	house. (<i>See</i> House flies.)	
<i>Fidia viticida</i> . (<i>See</i> Grape root-worm.)		muscoid, notes.....	358
Field crops, cost of production, N.Dak.....	690	remedies, U.S.D.A.....	299
insects affecting.....	852	Flood at Boise, Idaho, U.S.D.A.....	812
Can.....	252	protection in Papago Indian Reserva-	
marketing.....	595	tion, Arizona.....	889
prices of in 1912.....	190	Floods as affected by forests.....	642, 842
water requirements, U.S.D.A.....	825	in Alabama, U.S.D.A.....	510
(<i>See also special crops.</i>)		Cairo, Ill., district, U.S.D.A.....	510
experiments, error in.....	233	Ohio Valley, U.S.D.A.....	121
size and number of plats		Pascagoula and Pearl Rivers, U.S.	
in.....	734	D.A.....	121
peas. (<i>See</i> Peas, field.)		of Sacramento and San Joaquin water-	
Figs, abnormal roots of.....	849	sheds, U.S.D.A.....	415
breeding experiments, U.S.D.A.....	338	Flora of northern Sahara.....	626
culture experiments, U.S.D.A.....	338	Florida Station, financial statement.....	299
dried, preparation and use, U.S.D.A.....	462	notes.....	396
<i>Filaria stomoxeos</i> , notes, U.S.D.A.....	83	report.....	299
Filter sands, incrustation on.....	617	University, notes.....	396
Filters, household, notes.....	815	Flour, adulteration, U.S.D.A.....	61
Filtration, effects on diastatic activity.....	505	as affected by heat fumigation.....	253
Finnish Moor Culture Society, report.....	516	baking quality as affected by composi-	
Fir, Douglas, habitat extension, U.S.D.A.....	545	tion.....	864
plantation in Perthshire.....	644	tests.....	564
reforestation, U.S.D.A.....	545	composition and bread-making value,	
seed spotting under aspen,		relationship.....	765
U.S.D.A.....	544	from sugar beets, manufacture and use.	161
long-seasoned Douglas, strength tests.....	442	graham, studies, N.Dak.....	866
Fire blight, description and treatment, N.Y.		U.S.D.A.....	160
Cornell.....	348, 551	judging.....	60
Fires, forest. (<i>See</i> Forest fires.)		milling, treatise.....	263
Fish, analyses, R.I.....	626	paste, use in lime-sulphur mixtures...	459
as affected by fertilizers.....	821	red dog, analyses.....	467
water pollution.....	315	N.H.....	769
composition and food value.....	765	Wis.....	367
meal, analyses.....	367	valuation.....	460
as a food for live stock.....	270	Flower gardening, treatise.....	239
ponds, fertilizer experiments.....	731		

	Page.		Page.
Flower thrips, remedies, Fla.....	251	Foods, methods of analysis	412
Flowers, culture.....	840	Ohio.....	861
in Alaska, Alaska.....	743	mineral constituents of.....	809
double, inheritance of.....	341	nutritive ratio.....	362
oxides in.....	220	preservation.....	312
pigmentation in.....	421, 434	treatise.....	264
Fly, white. (See White fly.)		with nascent ozone.....	566
Foals, care and management, Kans.....	873	prices of in Australia.....	362
Fog, production by the sun, U.S.D.A.....	721	1912.....	190
relation to atmospheric humidity, U.S.		relation to dental decay.....	364
D.A.....	120	selecting and purchasing.....	868
<i>Fomes lucidus</i> , notes.....	446	treatise.....	412
<i>semitostus</i> , notes.....	547, 749	vegetable, analyses.....	659
treatment.....	552	of German Africa.....	59
Food accessories, notes.....	463	Foodstuffs, analyses, N.Dak.....	865
treatise.....	265	Asiatic, calcium and magnesium	
analysis, treatise.....	506	in.....	64
charts, U.S.D.A.....	766	Foot-and-mouth disease—	
chemistry, manual.....	598	immunization.....	379
progress in.....	412, 506	in Ireland.....	677
effect on amylase content of saliva.....	164	notes.....	582
hydrolyzed, effect on digestive tract.....	662	virus, destruction in manure.....	283
inspection, N.Dak.....	661, 865	Foot diseases in horses, treatment.....	783
Nev.....	266	Forage crops, culture experiments, Hawaii ..	224
and analysis, treatise.....	204	P.R.....	631
decisions, U.S.D.A.....	566	for pigs, Mo.....	670
in Florida.....	567, 766	handbook.....	530
Idaho.....	866	varieties.....	830
Michigan.....	463	Can.....	222
Minnesota.....	463	yields, U.S.D.A.....	32
Missouri.....	362	(See also special crops.)	
North Carolina.....	266	poisoning in horses, investigations..	499, 587
Ohio.....	266	<i>Forda occidentalis</i> , notes.....	252
Pennsylvania.....	867	Forest—	
Texas.....	61	administration in Baden.....	239
Virginia.....	567, 766	Baluchistan.....	44
Washington.....	266	India.....	149, 239, 342, 444, 643
Wisconsin.....	61	conditions in Ohio, Ohio.....	746
law in Illinois.....	61	western United States.....	666
Louisiana.....	566	cover, relation to soil formation.....	643
Michigan.....	61	distribution in San Juan Islands.....	643
South Dakota.....	566	ecological studies in northern Ontario.....	342
laws, treatise.....	266	fires, control in Michigan.....	239
of poor families in England and Scot-		Vermont.....	643
land.....	567	effect on standing hardwood timber,	
poisoning bacteria, notes.....	64	U.S.D.A.....	44
products, artificial colors in.....	661	notes, Conn.State.....	546
cost of distribution.....	492	state laws concerning.....	239
distribution.....	894	humus, use in agriculture.....	622
requirements of children.....	464	laws in Ohio, Ohio.....	746
supply and prices in New South Wales		Vermont.....	642
of Germany, treatise.....	162	nurseries, fertilizer experiments.....	444
Great Britain, treatise.....	162	parks, notes, Ohio.....	746
values, studies.....	362	planting in Connecticut, Conn.State.....	546
waste, reducing.....	463, 868	practices, effect on soil moisture and hu-	
(See also Diet.)		mus.....	343
Foods and diet, text-book.....	360	products of Canada.....	843
ash analyses, Ohio.....	861	soils. (See Soils.)	
bacteriology.....	563	statistics in Austria.....	444
bibliography.....	360	survey in Nova Scotia.....	342
classification.....	362	trees. (See Trees.)	
composition and nutritive value.....	463	Forestation as a correction of avalanches.....	842
cooperative buying and selling.....	868	of sand hills of Nebraska and	
diabetic, analyses, Conn.State.....	660	Kansas, U.S.D.A.....	43
examination.....	567	Forestry, bibliography.....	345
importance of mineral matter in.....	366	in Connecticut, Conn.State.....	546

	Page.		Page.
Forestry in Denmark.....	693	Frost fighting investigations, Nev	147
Hawaii.....	239	notes, U.S.D.A	121
Minnesota.....	239	forecasting in North Pacific States,	
Portugal.....	643	U.S.D.A	120
Prussia.....	746	in California, U.S.D.A	121
Saxony.....	746	western Colorado, U.S.D.A	510
Trinidad.....	643	injuries to fruits, notes, Oreg	147
Forests—		protection, notes	616
Alpine, management in Bavaria.....	842	studies, U.S.D.A	510, 511
as affected by origin of seed.....	841	Fructose, specific rotation of.....	715
windbreaks.....	842	Fruit buds, formation.....	437
composite type, management, U.S.D.A..	43	as affected by nitrogen	539
effect on climate.....	642, 842	setting, N.Y.State.....	339
conservation of snow	813, 814	winter injuries	41
stream flow	642	culture, relation to phenology and cli-	
hygienic influence	842	matology	15
National, sales policy, U.S.D.A.....	444	school at Klosterneuburg, re-	
natural regeneration in.....	842	port.....	414
of Alabama.....	746	treatise.....	837
Atlantic plain, relation to humidity		diseases in Wurttemberg.....	845
of Central States.....	642	treatment.....	551
Prince Georges County, Maryland...	441	Mich	146
public, state <i>v.</i> national control.....	491	distributing system, organization, Utah	543
relation to ground water.....	240	flies, control in Hawaii	53
selection system.....	240	notes	158
smelter injury.....	851	N.Y.Cornell.....	560
Forget-me-not, culture in Alaska, Alaska...	743	P.R.....	652
Formaldehyde—		remedies	657
as a blood preservative.....	676	fly, Mediterranean—	
detection in plant leaves.....	308	breeding in bananas	54
effect on germination of cereals.....	151, 346	introduction into United States ..	257
living plants.....	827	notes, Hawaii.....	234, 253
in sap of green plants.....	132	remedies.....	656
Formalin. (<i>See</i> Formaldehyde.)		studies.....	257
Formic acid as a fruit sirup preservative....	463	fly, Peruvian, notes.....	657
detection in food products	799	juices, investigations, Del.....	711
meat.....	716	manufacture.....	798
sirups.....	717	notes	116
determination in vinegar.....	798	lecanium, European, notes, Me.....	251
Formicidæ, studies.....	860	markings, relation to bud variation,	
Formol, titration.....	408	Oreg	147
Fowl plague virus, cultivation.....	180	products, adulteration.....	865
ticks, notes and remedies, U.S.D.A....	58	methods of analysis.....	865
Fowls and pheasants, hybridization experi-		scale, European, notes, Me.....	251
ments.....	575	Japanese, remedies	854
breeding for egg production	472	sirup, preservation with formic acid...	463
gonocytes and ovaries, studies.....	874	tree bark beetle, fungus-growing, inves-	
histology and physiology of pineal		tigations.....	858
gland	168	canker, treatment.....	348
immunization against spirochetosis...	588	crown gall, notes.....	348
inheritance of plumage characters in..	466	disease, treatment.....	45
insect parasites of	253	silver-leaf disease, investigations...	847
Plymouth Rock, barred color in.....	372	twig disease, notes.....	49
relation to tuberculosis in pigs.....	479	trees as affected by grass	339
Rhode Island Red, notes.....	574	insects affecting, Can.....	252
rotation of blood plasma and serum in.	881	wine, diminution of acidity in.....	117
White Leghorn, barred plumage pat-		micro-organisms in.....	209
tern in.....	471	Fruits, ash analyses, Ohio.....	861
(<i>See also</i> Poultry.)		blanching.....	867
Foxes, raising in eastern Canada and United		breeding experiments, Can.....	235
States.....	673	citrus. (<i>See</i> Citrus fruits.)	
Prince Edward Island.....	774	cold storage.....	745
Frogs, immunity against anthrax bacillus...	378	composition as affected by irrigation,	
<i>Frontina archippivora</i> , notes	356	Idaho.....	236
Frost, effect on seed germination.....	421	culture.....	745, 840
soils.....	212	experiments.....	235

	Page.		Page.
Fruits, culture experiments, Can.....	235	Fungi, relation to callose in root hairs.....	326
U.S.D.A.....	540	rust, wintering over in uredo stage...	346
disease resistance in.....	41	Fungicides—	
dried, preparation and use, U.S.D.A..	462	inspection, Me.....	146
exhibiting.....	745	legislation concerning.....	266
exports from South Australia.....	837	manual.....	341
fertilizer experiments.....	235, 639	preparation and use.....	459, 554, 651
forms of sugar in.....	40	Mich.....	146
germination of pollen.....	437	Tenn.....	236
growth as affected by meteorology...	510	wetting power.....	157, 451, 850
insects affecting.....	852	Fungus flora of South Africa, studies.....	45
keeping quality as affected by fertil-		parasites of plants, effect on soils....	150
izers.....	640	Fur-bearing animals, breeding and raising...	373
in storage.....	135	farming, booklet.....	672
lateral shoot-forming tendency.....	436	<i>Furcraea cabuya</i> fiber, strength of, U.S.D.A..	313
manurial requirements.....	745	Furfural, detection in ethyl alcohol.....	312
marketing cooperatively.....	340, 392	<i>Fusarium</i> —	
Utah.....	543	<i>batatatis</i> , relation to sweet potato stem	
new, descriptions, N.Y.State.....	838	rot.....	647
U.S.D.A.....	436	<i>gramineum</i> , relation to citrus gummosis,	
of Jamaica, notes.....	145	Fla.....	247
oleaginous, formation of fats in.....	201	<i>incarnatum</i> , notes.....	150
orchard, culture in British Columbia.	639	<i>n. spp.</i> , notes.....	243
enemies of.....	640	<i>nivale</i> , notes.....	47, 244, 445
varieties, N.Dak.....	237	<i>oxysporum</i> , notes.....	646
pollination experiments.....	235	<i>spp.</i> , descriptions and treatment, Fla....	847
pomaceous, pollination, Oreg.....	541	notes.....	243
precooling.....	436	<i>tuberivorum n. sp.</i> , description, Nebr....	47
premature dropping, N.Y.State.....	339	Fusarium, infection of grain by.....	244
preservation, treatise.....	116	taxonomy.....	444
reducing and nonreducing sugars in..	503	Fusel oil, determination in distilled spirits...	798
respiration in gases.....	135	<i>Fusicladium dendriticum</i> . (See Apple scab.)	
N.Y.Cornell.....	538	Gadflies, notes, U.S.D.A.....	454
root development.....	437	Galactan, determination in food and feeding	
seedless and malformed, notes, Oreg..	147	stuffs.....	411
small, as affected by lime.....	40	<i>Galerucella luteola</i> , remedies, N.Y.Cornell...	556
culture, Mich.....	148	<i>Galium aparine</i> , notes.....	144
in Alaska, Alaska.....	743	Gal-lamziekte, paper on.....	476
British Columbia.....	639	Gall sickness. (See Anaplasmosis.)	
diseases affecting, Can.....	242	<i>Galleria mellonella</i> , life history and remedies,	
industry in California.....	639	Tex.....	859
varieties.....	145	Galls, insect, morphology and biology.....	353
N.Dak.....	237	Game protection, officials, and organizations,	
spraying experiments.....	235	U.S.D.A.....	852
stone, silver-leaf disease affecting.....	45	<i>Ganaspis n. sp.</i> , notes, P.R.....	652
storage, ventilation, N.Y.Cornell.....	538	Garbage, analyses.....	823
uniform score card for.....	40	fertilizing value.....	129
use in the dietary, Ohio.....	862	Garden crops, insects affecting, Can.....	252
varieties.....	235	Okla.....	853
Can.....	235	varieties, U.S.D.A.....	540
U.S.D.A.....	540	design, treatise.....	42
for Pacific Northwest.....	745	plants as affected by oxalic com-	
Utah.....	147	pounds.....	49
variety adaptability, Oreg.....	147	slug, notes, Oreg.....	158
Fucidin, description.....	566	Gardening, course in for high schools.....	193
Fucosan, properties of.....	566	landscape, in Cleveland.....	495
Fuel, analyses.....	119	notes.....	395
Fumigation as affected by temperature and		teaching.....	41, 94
moisture, N.Y.State.....	762	treatise.....	341, 441, 495, 840
notes, Ky.....	640	window, for schools.....	898
Fungi, assimilation of nitrogen by.....	824	Gardens, home, preparation and management	495
development on fatty hydrocarbons..	133	insects affecting, Oreg.....	158
edible, digestibility.....	865	school. (See School gardens.)	
of South Africa.....	461	vacant lot, notes.....	95
mold, assimilation of salts by.....	28, 29, 30	Garlic, value in the diet.....	664
relation to iodine compounds....	133	wild, eradication.....	433

	Page.		Page.
Gaseous exchange in diet poor in nitrogen...	165	Glucose—Continued.	
metabolism as affected by muscular work.....	167	fatty acid esters of.....	269
Gases, insoluble, from organic matter, com- position.....	617	relation to polyneuritis gallinarum.....	865
Gastric and pancreatic fat digestion in infants.....	365	resorption in small intestine.....	268
Gear, traction, description and tests.....	389	standards for.....	867
Gelatin, nutritive value.....	868	Glucosid alcohols, synthesis.....	505
<i>Gelechia gossypiella</i> , notes, Hawaii.....	253	Glucosids as producers of hydrocyanic acid..	713
Gelignite, subsoiling experiments with.....	785	biochemical detection.....	509
Genetics, teaching in agricultural colleges.....	769	Glutamic acid as a source of ammonia, Iowa.....	723
Genitalia, female, biochemistry of.....	66	Gluten, determination in cereal products.....	799
Gentiopierin, decomposition by emulsin.....	505	feed, analyses.....	271, 467
<i>Geioica squamosa</i> , notes.....	252	N.H.....	769
Geological course for agricultural instructors.....	495	N.J.....	665
Geology of north-central Texas.....	209	R.I.....	570
south-central Washington.....	15	Vt.....	769
Geomyzinae, synopsis.....	657	Wis.....	367
Georgia College, notes.....	697	ash analyses, Ohio.....	861
Station, financial statement.....	599	meal, analyses.....	467
notes.....	300, 697	Vt.....	769
report of director.....	599	Glycerin, determination in meat products... 800	
Geranium, rose, culture in Algeria.....	149	Glycerol as affected by hydrogen peroxid... 309	
Germ middlings, analyses, Wis.....	367	chemical technology of.....	413
Gherkin skins, isolation of fat from.....	459	Glycocol as a source of ammonia, Iowa.....	723
Ginseng, culture, U.S.D.A.....	639	decomposition by mold fungi.....	28
diseases, notes.....	549, 751	formation in the body.....	63
Gipsy moth, control.....	255	Glycogen from different sources, comparison.. 166	
notes.....	252	hydrolysis by diastatic enzymes.....	166
Me.....	251	Glycolytic power, determination.....	663
Girls' agricultural clubs, notes.....	394, 395	<i>Gmelina arborea</i> , notes.....	443
canning clubs in Mississippi.....	495	<i>Gnomonia iliau</i> , notes.....	846
clubs, notes.....	93	<i>psidii</i> , notes.....	243
educating for the home.....	362	Goat wireworm, life history.....	476
sewing clubs, notes.....	395	Goats, digestion experiments.....	373
Glaciation in Indiana.....	815	injury due to grazing, U.S.D.A.....	543
<i>Gladiolus colvilli</i> , bacteriosis of.....	844	Goatskin trade of Red Sea region.....	69
Glanders—		Goldenrod, canyon, notes, Ariz.....	441
bacillus, agglutination by normal horse serum.....	677	Goldfinches, destruction of grain aphids by, U.S.D.A.....	452
diagnosis.....	284, 499, 677	<i>Gonia crassicornis</i> , notes.....	356
dissemination by public drinking troughs	499	(<i>Goniozus</i>) <i>Parasiorola cellularis</i> , notes, Hawaii.....	253
Glauconite sand, fertilizing value.....	625	<i>Gonitis</i> n. sp., description.....	456
Gliadin, alcohol soluble portion of.....	201	Monocytes in fowls, investigations.....	874
modifications in.....	608	Goose grass, notes.....	144
occurrence of lysin in.....	408	Gooseberries, growth as affected by meteor- ology.....	510
studies.....	201	new, descriptions, N.Y.State.....	838
<i>Glaesporium</i> —		Gooseberry fruit fly, notes, Oreg.....	158
<i>malicorticis</i> , notes, Oreg.....	153	mildew, studies.....	649
<i>musarum</i> , notes, Conn.State.....	547	treatment.....	45, 50, 249, 850
<i>polystigmaticum</i> n. sp., description.....	752	Gorse as a sand binder.....	427
<i>Glomerella</i> —		<i>Gossyparia spuria</i> . (See Elm scale, European.)	
<i>gossypii</i> , description and treatment, U.S. D.A.....	751	Grafting, notes.....	838
<i>rufomaculans</i> , description.....	450	Grain aphids, destruction by birds, U.S.D.A. 452	
enzymes produced by, Va.....	648	crops, handbook.....	530
notes.....	648	culture, intensive.....	337
Glucinium, effect on <i>Aspergillus</i> spp.....	825	diseases in Wurttemberg.....	845
utilization by fungi.....	28	drills, construction and adjustment... 186	
Glucosamin hydrochlorid as a source of nitro- gen.....	827	drying machine, description.....	688
Glucose—		germ, feeding value.....	263
composition and use, U.S.D.A.....	460	production limit on fertile soils.....	515
confectioners', analyses.....	867	screenings, digestibility, Md.....	367
determination in presence of other sub- stances.....	716	vitality of seeds in, Md.... 366	
effect on protein catabolism.....	663	smuts, treatment.....	47, 244
		Grains, active constituents of.....	169
		deterioration on fertile soils.....	515
		exhibits for farm and school use, Minn. 93	

	Page.		Page.
Grains, fungicidal treatment.....	326	Grass lands, fertilizer experiments.....	530, 728
infection by <i>Fusarium</i>	244	N.H.....	736
inoculation.....	326	mixtures for meadows, Vt.....	736
marketing.....	894	tests, U.S.D.A.....	32
parasitic injury to.....	446	scale, western cottony, notes.....	252
small, fertilizer experiments.....	125	seed, germination tests.....	740
(See also <i>Cereals and special crops.</i>)		Grasses—	
Gram, culture experiments.....	538	breeding experiments.....	138, 139
meal for pigs.....	873	culture experiments.....	631
Granadilla as a trap for fruit flies.....	657	Hawaii.....	224
Granville County, N.C., soil survey, U.S.D.A.....	16	in Brazil.....	428
Grape anthracnose, treatment.....	849	Siegerland.....	589
black rot, notes and treatment.....	349	the Ozarks, Mo.....	427
studies.....	849	effect on fruit trees.....	339
bramble leaf or roncet, studies.....	349	nitrate content of soils, N.Y.....	
court-coud, notes.....	551	Cornell.....	819
downy mildew, notes.....	350	exhibits for farm and school use, Minn... ..	93
review of investiga-		fertilizer experiments, Alaska.....	735
tions.....	249	fodder, of Indian forests.....	170
studies.....	155, 849, 850	for lawns, Mich.....	148
treatment.....	50, 551	growth on volcanic ash, Alaska.....	726
flea beetle, notes, Can.....	761	irrigation experiments.....	426
foliage, effect on development of fruit.....	439	new, for the South, U.S.D.A.....	428
gray rot, notes.....	349	nutritive value.....	170
treatment.....	349, 849	treatise.....	139
industry in South Australia.....	837	varieties.....	138, 428, 530
juices, studies, Del.....	711	Can.....	222
leaf-hopper, notes.....	158	P.R.....	631
peronospora, treatment.....	449	yield as affected by ground water level ..	531
phyloxera, notes.....	356	(See also <i>specific kinds.</i>)	
production of inverted leaf		Grasshoppers. (See <i>Locusts.</i>)	
galls by.....	854	Gravel, grouting tests in river beds.....	387
physiology, notes.....	439	Grazing investigations, U.S.D.A.....	531
pollen as affected by spraying mixtures	839	relation to timber reproduction,	
powdery mildew, treatment.....	850	U.S.D.A.....	543
roncet, studies.....	349, 551	Green June bug, notes, Ariz.....	453
root worm, new host plant of.....	657	manures, action of.....	820
rot, studies.....	450	tests.....	830
skins, isolation of fat from.....	459	manuring experiments, U.S.D.A.....	540
stocks, American, use in northern		in Japan.....	729
France.....	340	Greenhouses—	
Grapefruit. (See <i>Pomelos.</i>)		factors affecting light in, Mass.....	741
Grapes, absorption of foul gases by.....	49	fumigating with hydrocyanic acid gas... ..	41
adaptation and variety tests, U.S.		insects affecting, Can.....	252
D.A.....	41	Groceries, inspection, N.Dak.....	661
American, in Italian vineyards.....	238	in Virginia.....	766
breeding.....	641	Ground squirrels. (See <i>Squirrels, ground.</i>)	
cost of production.....	439	Groundnuts. (See <i>Peanuts.</i>)	
frost injuries.....	547	Groundsel, heredity of characters in.....	216
grafted, variations in.....	148	Growth as affected by diet.....	164
growth as affected by meteorology ..	510	fasting.....	869
Muscadine, investigations, U.S.D.A.....	238	energy expenditure required for.....	65
new, descriptions, N.Y.State.....	838	relation to mineral content of rations.....	64
production in Spain.....	439	theory of.....	64
pruning experiments.....	238	Grubs in West Indian soils.....	858
reducing and nonreducing sugars in.....	503	Guanidin, assimilation by mold fungi.....	29
respiration in gases.....	135	Guanin, assimilation by mold fungi.....	29
N.Y.Cornell.....	539	Guano, bat, analyses.....	516
scorching by sunlight.....	551	fertilizing value.....	129
sulphate of manganese for.....	838	bird, fertilizing value.....	129
utilization of solid residue.....	414	deposits in South Africa.....	516
Grapevines, deterioration in Sicily.....	349	fertilizing value.....	829
<i>Graphiola phanixis</i> , notes.....	345	Peruvian, composition.....	318
Graphite in soil, effect on plants.....	19	fertilizing value, N.C.....	31
Grass billbug, little, biology, N.C.....	56	production and use in 1911.....	213
notes, N.C.....	52	Guava diseases, notes.....	243
diseases in Wurttemberg.....	845	Guayule, culture experiments, Ariz.....	443

	Page.		Page.
Guinea—		Hay, yield as affected by ground water level.	531
corn, culture experiments.....	830	(See also Alfalfa, Clover, Timothy, etc.)	
grass, yields, Fla.....	224	Haze, effect on evaporation.....	721
pigs as affected by tuberculin.....	480	relation to atmospheric humidity,	
castration.....	168	U.S.D.A.....	120
immunity against anthrax bacillus..	378	Heat center of rabbits' brain, puncturing....	479
immunization against bovine tuber-		effect on lipoids in foods.....	365
culosis.....	480	starch grains.....	409
intra-uterine growth cycles of.....	168	(See also Temperature.)	
raising, U.S.D.A.....	472	Heating and ventilation, treatise.....	390
rotation of blood plasma and serum		Helianthus, culture experiments.....	331
in.....	881	Heliophila unipuncta. (See Army worm.)	
Guizotia cake, analyses and feeding value....	467	Heliothis obsoleta. (See Cotton bollworm.)	
Gulf Coast area, Tex., soil survey, U.S.D.A....	16	Helminthosporium gramineum, notes.....	243
Gum resin, extraction from <i>Boswellia serrata</i> ..	43	treatment....	845
Gumhár, notes.....	443	spp., notes.....	645
Gunpowder, fertilizing value.....	625	teres, studies.....	750
<i>Gymnoconia interstitialis</i> , notes, N.C.....	50	Helminths, parasitic, photomicrographs of... 478	
<i>Gymnogaster buphthalmia</i> , notes.....	858	<i>Helotium xeruginescens</i> , notes.....	649
<i>Gymnosporangium</i> —		Hemagglutinins in human milk.....	175
<i>japonicum</i> , notes, Conn.State.....	547	<i>Hemerobius gossypii</i> , studies, Okla.....	355
<i>juniperi-virginianæ</i> , effect on apple leaves,		<i>Hemichionaspis minor</i> , notes.....	359, 654
Va.....	648	<i>Hemileia vastatrix</i> , notes.....	851
<i>macrospus</i> , infection of apple leaves by... 647		<i>Hemitelia</i> sp., notes, U.S.D.A.....	456
<i>sabineæ</i> , notes.....	155	Hemlock, water, toxicity, Nev.....	111
Gypsum, diffusion in soils, Md.....	128	Hemoglobin, determination.....	408
effect on concrete.....	891	Hemolysins, production.....	581
germination of seeds.....	328	Hemorrhagic septicemia. (See Septicemia.)	
<i>Habrobracon hebetor</i> , notes.....	658	Hemp fiber, strength of, U.S.D.A.....	313
<i>Habrocytus fasciatus</i> , notes.....	562	notes, U.S.D.A.....	330
<i>Habronema microstoma</i> , notes, U.S.D.A.....	83	seed, germination energy of.....	538
<i>muscæ</i> , life history, U.S.D.A.....	82	tests.....	740
<i>Hæmaphysalis</i> spp., notes.....	58	oil, detection.....	613
<i>Hæmatobia serrata</i> . (See Horn-fly.)		sex anomalies in.....	27
<i>Hæmatosiphon inodora</i> , notes, U.S.D.A.....	454	Henequen fiber, strength of, U.S.D.A.....	313
<i>Hæmonchus contortus</i> , life history.....	476	Henrich, George, biographical notes,	
Hail as affected by forests.....	842	U.S.D.A.....	121
insurance in England and Wales.....	189	Hens, feeding experiments.....	672
France.....	790	laying records of different breeds.....	276
wounds on woody plants, studies.....	131	Leghorn, broodiness in.....	275
Hailstorm on James Island, S.C., U.S.D.A....	721	Herbaceous borders, treatise.....	840
<i>Haltica bimarginata</i> , notes, Me.....	252	Heredity—	
<i>chalybea</i> . (See Grape flea beetle.)		alternative, significance.....	67
spp., notes, Can.....	761	carriers of.....	67
Hams, curing in Prague.....	573	in animal breeding.....	570
preservation.....	312	bees.....	860
Hangul, hybridization experiments.....	171	beets.....	332, 832
Hanoverian Veterinary High School, notes..	597	cabbage hybrids, Va.....	638
Hardwood distillation products, marketing,		corn, Nebr.....	333
U.S.D.A.....	544	U.S.D.A.....	34
Hardwoods, management in eastern France..	842	dogs.....	770
Hariali grass, eradication.....	592	domestic animals.....	665
<i>Hartigia abdominalis</i> , investigations.....	260	<i>Hordeum distichum nutans</i>	738
Harvester ant, notes, Ariz.....	453	man.....	769
Hawaii Station, report.....	299	Nicotiana.....	216, 321
Sugar Planters' Station, notes.....	97	oats and wheat.....	532
Hawthorn seeds, after-ripening of.....	134	plant hybrids, Miss.....	320
Hay, culture experiments.....	138, 427	sheep, N.H.....	771
N.H.....	736	sweet corn, U.S.D.A.....	35
fertilizer experiments.....	228, 427, 530, 631	tobacco, Conn.State.....	536
Ohio.....	728	of blood reactions.....	167
fertilizers for.....	517	characters in groundsel.....	216
from an "alkali flat," analyses, Can....	270	composition in wheat, Wash.....	835
irrigation experiments.....	631	double flowers.....	341
measuring in ricks or stacks, U.S.D.A....	532	high laying qualities in fowls.....	472
native, analyses, Wyo.....	370	mammæ in Duroc Jersey swine.....	470
production in Vermont, Vt.....	736	plumage characters in fowls.....	466
varieties.....	228		

Heredity—Continued.	Page.		Page.
of poll character in cattle	68	Home economics, syllabus.....	496
self-sterility in mignonette.....	136	treatise.....	162, 266
sex, studies.....	466	science. (See Home economics.)	
sugar and dry matter in mangels, Can..	270	Hominy, ash analyses, Ohio.....	861
winter resistance in wheat.....	635	feed, analyses, N.H.....	769
presence and absence theory.....	466	R.I.....	570
review of literature.....	466	Vt.....	769
rôle of nucleus and cytoplasm in.....	66	Wis.....	367
significance of chromosomes in.....	321	meal, analyses, Ky.....	270
theory of factors in.....	433	and feed, analyses, N. J.....	666
treatise.....	665	v. barley for pigs.....	671
Heron, distribution and migration, U.S.D.A.	352	Honey, chemistry of, treatise.....	109
<i>Herpetomonas culicis</i> , studies.....	762	vetch, notes, U.S.D.A.....	233
Herring roe, dried, organic bases in.....	863	Honeysuckle, Tartarian, culture, Alaska..	743
Hessian fly, notes.....	252	Hookworm disease in sheep and other ani-	
Md.....	353	mals.....	287
Ohio.....	793	Hop aphid, studies and bibliography,	
<i>Heterodera radiculicola</i> , notes.....	549	U.S.D.A.....	254
<i>Heterospilus prosopidis</i> , notes, Hawaii.....	253	flea beetle, notes, Can.....	761
<i>Heterosporium betæ</i> n. sp., notes.....	647	industry in Wurttemberg, history....	141
<i>echinulatum</i> , parasitism.....	647	mildew, studies, N. Y. Cornell.....	346
Heterozygosis in evolution and plant breed-		powdery mildew, notes, Conn. State..	547
ing.....	31	sprouts as an early spring salad.....	161
<i>Hevea brasiliensis</i> . (See Rubber, Para.)		Hops as affected by refrigeration, U.S.D.A..	13
Hexoic acid in butter, constitution.....	508	culture and ripening, Oreg.....	534
Hibiscus, breeding experiments, Hawaii.....	235	fertilizer experiments, Oreg.....	534
culture in Burma.....	736	Japanese, sex anomalies in.....	27
<i>Hibiscus sabbdariffa</i> , description and analyses..	161	judging, Oreg.....	535
Hickory bark borer, remedies.....	457	methods of analysis, Oreg.....	535
grass, notes, Ariz.....	441	red spider affecting, U.S.D.A.....	261
Highways. (See Roads.)		<i>Hordeum distichum nutans</i> , heridity in.....	738
<i>Hippodamia convergens</i> , notes, P.R.....	652	<i>Hormiscium colocasiae</i> , notes.....	345
studies, Okla.....	355	<i>Hormodendron</i> sp., notes.....	647
Hippuric acid, decomposition by mold fungi..	28	Horn, fertilizing value.....	129
Histology, text-book.....	676	fly, notes, U.S.D.A.....	454
Hog bristles, fertilizing value.....	129	parasite, notes.....	53
cholera, control.....	500	Hornet poison, investigations.....	57
Cal.....	888	Horns, heredity in cattle.....	68
immunization.....	482, 682	Horn-tails of North America.....	359
nature and prevention, Cal.....	82	Horse blood, red and white corpuscles in...	783
treatment, Md.....	384	breeding in Algiers, government aid to	573
notes.....	888	France and Hungary, gov-	
Tex.....	889	ernment aid to.....	573
U.S.D.A.....	896	Sao Paulo.....	368
outbreak at Algiers.....	482	industry in British Isles.....	273
relation to <i>Bacillus voldagen</i>	482	Prussia.....	171
virus, fixed, preparation.....	287	chestnut wounds, larvæ in.....	357
studies.....	681	chestnuts, feeding value.....	170
erysipelas, diagnosis.....	179, 888	diseases, notes, Miss.....	676
infection in man.....	780	Horseflies, notes, U.S.D.A.....	454
Hogs. (See Pigs.)		Horseradish flea beetle, notes, Can.....	761
Hohenheim Institute for Plant Protection,		Horses—	
report.....	845	Arabian, studbook.....	69
Holden, Whittaker, biographical notes,		bacterial flora of large intestine.....	466
U.S.D.A.....	121	breeding.....	672
Home conveniences, paper on.....	465	experiments, P.R.....	666
economics at Cornell University.....	898	British breeds.....	571
bibliography.....	93, 567, 792	care and management, Kans.....	873
contests in, U.S.D.A.....	299	cavalry, improving.....	471
high school lessons in.....	792	cost of raising, U.S.D.A.....	190
instruction for young girls..	695	digestion in.....	671
in Belgium.....	92	draft, judging.....	471
New Mexico.....	92	feeding.....	171
West Vir-		experiments, Kans.....	873
ginia.....	92	Pa.....	773
papers on.....	362	Wyo.....	370

	Page.		Page.
Horses—Continued.		Hybridization experiments with strawber-	
immunization against influenza, pectoral		ries, Alaska.....	742
form.....	482, 483	(See also Plant breeding and Animal	
tetanus, U.S.D.A.....	781	breeding.)	
inheritance of racing performances in.....	773	Hydriodic acid salts, use against tubercu-	
jumping conformation.....	874	losis.....	481
limb tendons of.....	570	Hydrocarbons, fatty, development of fungion.	133
poisoning by horsetail, Can.....	281	heavy, detection.....	529
pulse irregularities in.....	671	petroleum, absorption in the	
rotation of blood plasma and serum in.....	881	intestine.....	768
Thoroughbred, breeding.....	69	Hydrochloric acid salts, use against tubercu-	
tractive power of.....	86	losis.....	481
treatise.....	573	Hydrocyanic acid—	
types of in Europe and India.....	171	gas, fumigating greenhouses with.....	41
v. motor power, treatise.....	388	fumigation, Ky.....	640
trucks, comparison.....	489	in cherry laurel, studies.....	133
Horseshoeing, treatise.....	292, 682	Johnson grass.....	869
Horsetail, poisoning of horses by, Can.....	281	occurrence in the plant world.....	713
Horticultural—		Hydrogen peroxid as a seed sterilizer.....	844
courses, notes.....	41	effect on glycerol.....	309
education, demonstration orchards in.....	41, 94	milk.....	806
in Austria-Hungary.....	100	Hydrophobia. (See Rabies.)	
Netherlands.....	898	Hygiene and diet in schools, treatise.....	363
United States.....	791	<i>Hymenia fascialis</i> , notes, U.S.D.A.....	456
experimental fields in south Holland, re-		<i>perspectalis</i> , studies, U.S.D.A.....	455
port.....	145	<i>Hymenochete noxia</i> , notes.....	547, 749
industry in Ghent, Belgium.....	338	treatment.....	552
law in Arizona.....	341	Hymenopterous parasites, minute, handling.	658
work at Woburn farm.....	638	Hypochlorite of lime in water, effect on vege-	
notes, Hawaii.....	235	tation, Can.....	242
Horticulture, European, application of sci-		<i>Hypochnus solani</i> , notes.....	152
ence in.....	41	<i>violaceus</i> , notes.....	51
in Denmark.....	693	<i>Hypoderma bovis</i> , notes.....	357, 761
relation to climate.....	40	occurrence in Canada.....	357
text-book.....	193	<i>Hypolycena philippus</i> , destructive to pine-	
Hotels, inspection in South Dakota.....	567	apples.....	655
Virginia.....	766	<i>Hypostena</i> sp., notes, P.R.....	52
Hothouses, fumigation, Ky.....	641	<i>Hypsopygia costalis</i> . (See Clover-hay worm.)	
House flies, effect of metamorphosis on bac-		Ice cream, brick, manufacture.....	376
teria.....	357	examination.....	59
handbook.....	656	from homogenized cream.....	879
hibernation of.....	559	gelatin or gum in, N.Dak.....	865
notes, Md.....	353	standards, U.S.D.A.....	777
parasite of.....	359	stores, inspection in Virginia.....	766
relation to leprosy.....	457	harvesting.....	88
Household appliances and conveniences.....	362	houses, construction.....	88
efficiency, paper on.....	465	scald of fruits, studies.....	135
Housekeeping schools in Norway.....	597	storm in Illinois, U.S.D.A.....	121
Huckleberries, cost of distribution.....	492	<i>Icerya purchasi</i> . (See Cottony cushion-scale.)	
Huisache, notes, Ariz.....	441	<i>Ichneumon extrematis</i> , notes, U.S.D.A.....	855
Humidity as affected by forests.....	842	Idaho Station, notes.....	97, 794
coefficient of.....	626	University, notes.....	97, 794
effect on grapes.....	839	<i>Idia fasciata</i> , notes.....	354
in Death Valley, U.S.D.A.....	722	<i>Igenhauzia triloba</i> , notes, Ariz.....	441
of air of mines, U.S.D.A.....	121	<i>Ilex aquifolium</i> , variations in salt content.....	28
regulator, description, U.S.D.A.....	107	Illinois Station, financial statement.....	194
relation to haze, fog, and visibility,		notes.....	396, 697
U.S.D.A.....	120	report.....	194
Humus acids, investigations.....	124	University, notes.....	97, 396, 697
determination in soils.....	718, 796	Immunity, physical theory of.....	174
distribution in California soils.....	415	Immunization. (See Anthrax, Tuberculosis,	
effect on plant growth.....	417	etc.)	
solubility of phonolite.....	319	Impregnation, artificial, in mammals.....	66
forest, use in agriculture.....	622	Inbreeding, review of literature.....	466
substances, effect on weathering of		Incubation and brooding, manual.....	373
silicates.....	123	Incubator, electrical, for bacteriological work,	
Hurricanes, West Indian, U.S.D.A.....	120	N.Y.State.....	222
<i>Hyalomma aegyptium</i> , notes.....	58	India rubber. (See Rubber.)	
		Indiana Station, notes.....	698

	Page.
Indicanuria in children, relation to meat ingestion.....	365
Indicators, mechanical, inaccuracies in.....	788
Indigo wilt, notes.....	446
Industrial cooperation, bibliography and text-book.....	594
work in Hamilton County, Indiana.....	394
Infantile paralysis, relation to stable flies.....	358,
559, 560	
Infants—	
amount of water required by.....	62
gastric and pancreatic fat digestion in.....	365
metabolism of calcium and phosphoric acid in.....	166
rôle of mineral salts in metabolism.....	366
Influenza, equine, pectoral form—	
immunization.....	482, 483
treatment.....	385, 483
Inheritance. (<i>See</i> Heredity.)	
Inosit-phosphoric acid of cotton-seed meal and wheat bran, Tex.....	805
Insect galls, morphology and biology.....	353
parasites of domestic fowls.....	253
Insecticide law in California, Cal.....	852
Insecticides—	
analyses, Can.....	235
inspection, Me.....	146
legislation concerning.....	266
manual.....	341
oil, effect on citrus fruits.....	254
preparation and use.....	459
Mich.....	146
Okla.....	853
Tenn.....	236
sampling, Cal.....	852
tests.....	758
toxicity formula for.....	52
(<i>See also specific forms.</i>)	
Insects—	
household, habits and remedies, Ohio....	653
injurious—	
bibliography.....	652
in Antigua.....	756
England.....	653
German colonies.....	653
Government of Moscow.....	852
Ireland.....	555
Java.....	852
Nebraska.....	252
New York.....	252
St. Lucia.....	852
Sumatra.....	853
law, Can.....	252
notes.....	353
Ariz.....	453
Fla.....	251
Md.....	353
Me.....	251
Mont.....	652
N.C.....	52
P.R.....	652
remedies.....	653
Ky.....	640
Md.....	146
Mich.....	146
to apples.....	353
barley.....	555

Insects—Continued.

	Page.
injurious—continued.	
to cabbage.....	338
cacao.....	653
camphor trees.....	853
cauliflowers.....	338
coconut palms.....	53
coffee.....	653
cotton.....	653, 756
domestic animals, Can.....	252
field crops, Can.....	252
fire-killed timber.....	53
fruit trees, Can.....	252
remedies.....	45
garden and truck crops, Okla.....	853
crops, Can.....	252
Oreg.....	158
greenhouses, Can.....	252
lentils.....	853
live stock, U.S.D.A.....	454
man, Can.....	252
nuts.....	354
onions, U.S.D.A.....	453
orach.....	853
orchards.....	640
Oreg.....	158
osiers.....	853
peanuts.....	347
pears.....	756
potatoes, Md.....	336
Me.....	259
spinach.....	556
sugar beets.....	153
cane.....	353, 858
Fla.....	833
P.R.....	52
U.S.D.A.....	53
tobacco.....	353, 653, 756
trees, Can.....	252
instinct of, treatise.....	52
mill, destruction by heat.....	253
of California.....	158
Labrador.....	353
relation to chestnut blight.....	753
disease in man.....	756
plague.....	756
spirochetosis.....	883
scale. (<i>See</i> Scale insects.)	
soil-infesting, notes, N.J.....	653
(<i>See also specific insects.</i>)	
Inter-Mountain Good Roads Association.....	291
International—	
catalogue of meteorology.....	510
Congress of Agriculture.....	101
Institute of Agriculture.....	1
Radiotelegraph Conference, U.S.D.A.....	120
Veterinary Congress.....	100
Intestinal juice of dogs, alkalinity.....	268
Intestines, methods of examining.....	408
resorption of sugar in.....	268
Intracutaneous reaction, diagnostic value for contagious abortion in cows.....	586
Iodin compounds, relation to bacteria, yeast, and mold fungi.....	133
use against spirochetosis in fowls.....	484
determination in water.....	797

	Page.		Page.
Iodoform, detection in ethyl alcohol.....	321	Irrigation—Continued.	
Iowa College, notes.....	97, 600, 698	relation to snowfall.....	813
County, Wis., soil survey, U.S.D.A.....	17	supplementary, in dry farming, Ariz.....	735
Station, notes.....	97, 600, 698	surface, v. subirrigation for vegetables, P.R.....	638
<i>Irbisia brachycerus</i> , notes.....	454	systems, seepage losses from.....	181, 289
<i>Iridomyrmex humilis</i> , notes.....	654	use of windmills in.....	891
studies and bibliogra- phy, U.S.D.A.....	563	water. (See Water.)	
<i>Iris</i> , culture in Alaska, Alaska.....	743	wood-stave pipe in.....	84
Iron as an antidote for cotton-seed meal poi- soning.....	477	Irritability in plants, studies.....	421
chlorid, effect on activity of malt diastase.....	528	<i>Isaria psychidæ</i> n. sp., investigations.....	46
determination in cane and beet sugar fac- tory products.....	613	<i>Itionida anthici</i> n. sp., notes.....	357
foods.....	809	<i>inopsi</i> , notes.....	656
plants.....	797	<i>Itoplectis conquisitor</i> , feeding habits.....	261
effect on <i>Aspergillus fumigatus</i>	30	Ivy scale, notes.....	654
chlorosis in plants.....	826	<i>Iria maculata</i> , bacteriosis of.....	844
growth of tubercle bacilli.....	381	<i>Irodex</i> spp., notes.....	58
legume bacteria.....	733	Ixodidae, biology.....	58
filings, effect on tomatoes, Md.....	339	Jackson County, Mo., soil survey, U.S.D.A.....	17
ore deposits in Virginia coastal plain.....	513	Jacksonville area, Fla., soil survey, U.S.A.....	16
oxid, effect on germination of seeds.....	528	Jams, adulteration.....	60
removal from water supplies.....	617	Japanese beetle fungus, propagation, P.R.....	652
sulphid, effect on assimilation of rock phosphate.....	419	cane, culture experiments, Fla.....	224
welding.....	593	fruit scale, remedies.....	354
Ironweeds, analyses.....	320	Jay, California blue, destructive to almonds..	52
Irrigation—		Jellies, manufacture.....	798
by pumping in Kansas, U.S.D.A.....	121, 181	Johne's bacillus, pathogenicity.....	285
convoluted tube wells for.....	485	disease, animals susceptible to.....	285
effect on composition of—		in sheep, studies.....	81
alfalfa hay.....	139	pathological anatomy.....	284
fruits, Idaho.....	236	treatment.....	587
potatoes, N.Dak.....	425	Johnson grass, feeding value.....	869
sugar beets, N.Dak.....	226	Jolly bodies in erythrocytes of mammals....	478
engineering, treatise.....	683	<i>Junco hyemalis</i> , destruction of grain aphids	
experiments.....	139, 181	by, U.S.D.A.....	453
Ariz.....	484	<i>Juncus balticus</i> , analyses, Can.....	270
N.Dak.....	226	June bug, green, notes, Ariz.....	453
Nev.....	138	Juniper, alligator, germination of seed, U.S.D.A.....	544
U.S.D.A.....	31, 32	Chinese, rust, notes, Conn.State.....	547
in Prussia.....	426	Jute, fertilizer experiments.....	830
handbook.....	289	root rot, notes.....	445
in Bengal.....	486	wastes, fertilizing value.....	129
California.....	386	Kachess dam, Washington, construction....	386
U.S.D.A.....	588	Kafir corn—	
Canada.....	84	as a grain crop, U.S.D.A.....	738
Catalonia and Aragon.....	182	ash analyses, Ohio.....	861
Egypt.....	784, 816	culture experiments, Ariz.....	426
India.....	683	Nebr.....	225
Nebraska.....	289	in Texas Panhandle, U.S.D.A.....	429
North Dakota.....	182	grain smut, notes, Conn.State.....	547
Oregon.....	486	nutritive value and use in the diet, U.S.D.A.....	864
Papago Indian Reservation, Arizona.....	889	Kainit, destruction of weeds by.....	215
Porto Rico.....	182, 889	effect on germination of salts.....	328
Siegerland.....	589	fertilizing value.....	126, 319
Sudan.....	784	Ala. College.....	335, 336
Utah.....	722	Kale, cooperative experiments.....	138
Wyoming.....	84	thousand-headed, varieties.....	530
notes, P.R.....	85	<i>Kaliosysphinga ulmi</i> , life history and reme- dies, N.Y.Cornell.....	557
U.S.D.A.....	540	Kangaroo botfly, notes.....	761
pamphlet.....	181	Kansas College, notes.....	97, 497, 698
pipe. (See Pipe.)		Horse Breeders' Association, Kans.....	873
project in Orange Free State.....	487	Station, notes.....	97, 497, 698
Washington.....	486	western, soil survey, U.S.D.A.....	17
pumping plants for.....	784	Kaoliang, culture experiments, N.Dak.....	424
		U.S.D.A.....	430

	Page.		Page.
Katmai volcano eruption, effect on atmospheric transparency, U.S.D.A.....	121	Lands, swamp, reclamation.....	182
Kéfir, preparation.....	475	treatise.....	890
Kelp, distribution.....	322	valuation, Christ-Junge method.....	595
fertilizing value, U.S.D.A.....	25	waste, reclamation.....	149
freshly cut, potash from.....	519	wheat, of western Australia.....	315
potash and other products from.....	128	Landscape gardening in Cleveland.....	495
Kentucky Station, notes.....	97, 397, 794	<i>Laphygma frugiperda</i> . (See Army worm, fall.)	
University, notes.....	397	Larch, American, cambium development in.....	343
Kerosene, power from.....	184	defoliated, growth in.....	643
traps for fruit flies.....	656	needles, drying, notes.....	156
Khadi-ferment, toxicity.....	460	sawfly, notes, Can.....	252
Kidney worms, localization and development in hogs.....	783	western, properties and uses, U.S.D.A.....	43
Kitchen, model French.....	362	Lard adulteration, detection.....	798
Kitchens, traveling, descriptions.....	567	substitute in Austria.....	564
Knots, methods of making.....	390	metallic nickel in.....	459
Kudzu grass, yields, Fla.....	224	Larkspur, poisoning of live stock by, U.S.D.A.....	280
<i>Kuehneola albida</i> , notes and treatment, N.C.....	50	<i>Lasioderma serricorne</i> . (See Cigarette beetle.)	
Laborers, farm. (See Agricultural laborers.)		<i>Lasiodiplodia theobromæ</i> , notes.....	155, 345
<i>Lachnosterna</i> sp., notes, P.R.....	52	<i>Lasius niger americanus</i> , life history.....	860
spp., notes, U.S.D.A.....	561	Lauderdale County, Miss., soil survey, U.S.D.A.....	16
<i>tristis</i> , life history.....	359	Laundrying, home, aids in.....	792
Lacquers, methods of examination.....	811	Laurel, silver leaf disease affecting.....	845
Lactic acid—		Lava bricks, efflorescence on, Hawaii.....	203
bacteria as affected by acid-destroying yeasts, Mich.....	8	Lawn mixtures, tests.....	145
development in milk.....	172	Lawns, starting, Mich.....	148
forms of.....	475	Lead arsenate, analyses, Wash.....	42
determination in presence of protein.....	309	lime-sulphur mixture, studies, Iowa.....	802
wine.....	119	powdered, use.....	852
occurrence in corn silage, Iowa.....	712	use against tobacco hornworms, U.S.D.A.....	356
sisal.....	615	chromate, insecticidal value.....	758
Lactose, resorption in small intestine.....	268	determination in baking powder.....	799
<i>Lactuca</i> spp., rubber from.....	241	occurrence in baking powders, N. Dak.....	866
Lady beetle, corrupted, notes, Ariz.....	453	oxid, effect on germination of seeds.....	528
beetles, notes, U.S.D.A.....	261	salts, effect on disease susceptibility in cereals.....	844
<i>Laelaps echidninus</i> , distribution on rats.....	755	wheat.....	520
<i>Lagenaria vulgaris</i> , notes.....	461	Leadwort, notes, Ariz.....	441
<i>Lagerstræmia lanceolata</i> , notes.....	443	Leaf hairs, chemotactic reaction.....	828
Lambs, breeding for fur.....	872	miner, serpentine, studies and bibliography, U.S.D.A.....	857
crossbred, tests.....	669	mold, fertilizing value.....	622
docking and castrating, Mo.....	872	Leather, adulteration, N. Dak.....	866
feeding experiments.....	772	investigations, U.S.D.A.....	207
Can.....	271	wastes, fertilizing value.....	129
Colo.....	871	Leaves, arsenic and manganese content.....	628
Idaho.....	870	bacterial tubercles in.....	30
S.Dak.....	669	carbohydrates in, variations.....	827
range, cost of fattening.....	572	leaching of nitrogenous and mineral materials from.....	218
searing iron v. knife for detailing.....	470	respiration in, periodicity.....	324
self-feeders and feeding yards for, Colo.....	872	water transpiration in.....	217
(See also Sheep.)		<i>Lecanium nigrofasciatum</i> , notes, Md.....	353
Laminarin in Fucoideæ.....	566	<i>quercifex</i> , notes.....	53
Lamziekte, papers on.....	476	Lechosa fruit fly, notes, P.R.....	652
Land banks in South Africa.....	90	Lecithin—	
organization and operation.....	692	as a source of phosphoric acid.....	423
grant colleges. (See Agricultural colleges.)		emulsions, preparation and determination of strength.....	809
ownership, theories of Karl Marx.....	491	importance in metabolism of adults.....	664
plaster. (See Gypsum.)		of egg yolk.....	503
taxation.....	391, 692	Legumes, effect on quality of butter.....	278
tenure in England, treatise.....	895	exhibits for farm and school use, Minn.....	93
title registration, manual.....	895		
Lands, irrigable, in Utah.....	722		
irrigated, settlement, U.S.D.A.....	491		
overflow, reclamation.....	85		

	Page.		Page.
Legumes, preservation, treatise.....	116	Light, effect on—Continued.	
use in the dietary, Ohio.....	862	formation and germinability of	
Leguminosæ, specialization of nodule bac-		seeds.....	526
teria of.....	733	germination of seeds....	421, 525, 828, 836
Leguminous plants—		metabolism.....	567
breeding experiments.....	138, 139	plants.....	421, 526
culture experiments.....	631	factors affecting in greenhouses, Mass.	741
in Brazil.....	428	relation to formation of formaldehyde.	132
India.....	736	plant succession.....	218
fertilizer experiments.....	227	(See also Sunlight.)	
fertilizing value.....	820	Lightning damage near San Francisco,	
fungicidal treatment.....	326	U.S.D.A.....	121
inoculation.....	142, 326	protection of buildings from....	88
N.Y.Cornell.....	228	Lignocelluloses and animal assimilation,	
experiments.....	316	notes.....	65
new, analyses and feeding value.....	467	<i>Ligula simplicissima</i> affecting waterfowl....	784
nitrogen assimilation by.....	326	Lilac disease, description and treatment....	249
varieties.....	138, 427	Lilies, treatise and bibliography.....	341
P.R.....	631	Lime, analyses.....	119, 520
Leishmania, photomicrographs of.....	478	and magnesia ratio, effect on plant	
Lemon black pit, description.....	650	growth.....	520
diseases, notes.....	243	in soils.....	730
industry in California.....	440	as a neutralizer in dairy products....	798
skins, isolation of fat from.....	459	top dressing for pastures.....	632
Lemons, rapid curing.....	440	burning, U.S.D.A.....	590
Lemurs, chromatin bodies in erythrocytes of.	478	determination in plant ashes, P.R....	609
Lentils, analyses.....	569	displacement by water in leaves.....	219
insects affecting.....	853	distribution and loss in soils, Md.....	128
<i>Lepidosaphes ulmi</i> . (See Oyster-shell scale.)		effect on alkali tolerance of wheat seed-	
<i>Lepiota procera</i> , prevalence in South Africa..	461	lings.....	322
Leprosy bacillus, dissemination by house fly.	457	apples, Pa.....	438
in rats.....	651	moor soils.....	823
<i>Leptinotarsa decemlineata</i> . (See Potato beetle,		nitrification in soils, N.C....	21
Colorado.)		Va.....	622
<i>Leptodictya tabida</i> , notes.....	353, 357	soils, Hawaii.....	210
<i>Leptosphaeria sacchari</i> , notes.....	345	feed, methods of analysis.....	311
<i>Leptothyrium pomi</i> , notes.....	154	injurious to fish.....	821
Lettuce bacterial disease, description, Fla...	242	small fruits.....	40
drop, description and treatment, Fla	846	juice, nitrogenous constituents of....	161
growth in shade, U.S.D.A.....	130	loss from soils, Fla.....	211
Sclerotinia disease of.....	646	niter. (See Calcium nitrate.)	
wild, rubber from.....	241	nitrogen. (See Calcium cyanamid.)	
<i>Leucæna glauca</i> , analyses.....	215	of Thomas slag, efficiency.....	823
Leucin as a source of ammonia, Iowa.....	723	relation to dry spot of cereals.....	46
conversion into glycocoll.....	64	requirement of animals, studies.....	65
Leucite, fertilizing value.....	319	soils, determination....	797
Leucocytes, blood and exudate, phagocytic		salts, effect on solubility of phonolite..	319
activity.....	881	silicious, as a fertilizer.....	520
counting in milk.....	206	sterilization of soils by.....	730
Leucocytic extract, therapeutic value.....	500	water by.....	814
<i>Leuconostoc mesenteroides</i> , notes.....	153	sulphur lead arsenate mixture, studies,	
<i>Leucopis bella</i> , notes.....	455	Iowa.....	802
<i>Leucoptera coffeella</i> , notes.....	856	sulphur mixtures—	
P.R.....	652	analyses, Can.....	235
Leukemia in fowls, studies.....	285	Wash.....	42
Levulose in Fucoideæ.....	566	as a summer spray, Md.....	146
preparation.....	803	effect on peaches, Ark.....	640
Lice, bird biting, distribution and species		home preparation, N.J.....	543
forming among.....	53	injurious ingredients of.....	41
biting and sucking, notes, U.S.D.A....	454	methods of analysis.....	797
relation to recurrent fever.....	479	use against gooseberry mildew.....	249
Life zones of New Mexico, U.S.D.A.....	755	of flour paste in.....	459
Light, colored, effect on plants.....	526	trass, zeolitic properties.....	518
determination of intensity.....	408	use against mosses, Vt.....	741
effect on—		swede finger-and-toe disease	752
beet seeds.....	332	on swamp land, Can.....	223
carbon dioxid production in		value in the diet.....	664
plants.....	324	Limes, culture in West Indies.....	745

	Page.		Page.
Limestone, ground, diffusion in soils, Md.....	128	Lucern, blue, germination as affected by fer-	
fertilizing value, Fla.....	224	tilizers.....	327
<i>Limex agrestis</i> , notes, Oreg.....	158	(See also Alfalfa.)	
Liming, effect on composition of turnips, R. I.	418	Lumbago oil, analyses, N. Dak.....	811
yield of cotton.....	430	Lumber estimator, book.....	240
experiments.....	215	(See also Timber and Wood.)	
Tenn.....	25	Lumpy jaw. (See Actinomycosis.)	
notes, Wis.....	623	Lunches for school children.....	464, 465
Limquats, paper on.....	839	Lungs of mammals, weight of.....	476
<i>Linguatula tænioides</i> , treatment.....	676	Lupine flakes for sheep.....	572
Linseed cake for steers.....	272	seeds, germination tests.....	740
meal, analyses, Ky.....	270	Lupines and mustard, continuous culture....	431
N.J.....	666	as a sand binder.....	427
R.I.....	570	blue, germination as affected by fer-	
Vt.....	769	tilizers.....	327
ash analyses, Ohio.....	861	fertilizer experiments.....	631
oil, detection.....	613	growth as affected by fertilizer salts.....	329
Lintner's scale, notes, Me.....	251	irrigation experiments.....	631
<i>Linyphia phrygiana</i> , notes, Me.....	256	transformation of nitrogen by.....	133
Lipins, importance in diet during growth....	664	Lycopin, development in tomatoes.....	132
Lipoids, antigenic properties.....	782	<i>Lygæonematus mæstus</i> , notes.....	861
in foods, destruction by heat.....	365	<i>Lygus pratensis</i> . (See Tarnished plant bug.)	
<i>Lippia wrightii</i> , notes, Ariz.....	441	<i>Lyperosia irritans</i> , notes, U.S.D.A.....	454
Liquor from fermented rice.....	118	<i>minuta</i> , mouth parts and sucking	
Liquors, sulphite-cellulose, utilization.....	129	apparatus of.....	760
<i>Lissorhoptrus simplex</i> , notes.....	259	Lysin, occurrence in gliadin and zein.....	408
Lithium salts, effect on disease susceptibility		Macaroni wheat. (See Wheat, durum.)	
in cereals.....	844	Machinery. (See Agricultural machinery.)	
wheat.....	520	<i>Macrocentrus cerasivoranæ</i> n. sp., description..	563
Litter, analyses.....	119	<i>Macrophoma vestita</i> , notes.....	155
Livestock—		<i>Macrosiphum granaria</i> , destruction by birds,	
breeding, treatise.....	68	U.S.D.A.....	452
combining rations for.....	170	<i>Macrosporium sarcinula</i> , treatment.....	245
cost of gains on pasture.....	170	<i>solani</i> , description and treat-	
fertility as affected by feeding stuffs.....	170	ment, Fla.....	847
import and export, inspection and quar-		Madera area, Cal., soil survey, U.S.D.A.....	17
antine, U.S.D.A.....	778	Magnesia and lime ratio, effect on plant	
industry in Alberta.....	467	growth.....	520
Bosnia.....	368	in soils.....	730
Dutch East Indies.....	368	displacement by water in leaves....	219
Great Britain.....	169	loss from soils, Fla.....	211
Sao Paulo.....	368	Magnesium—	
insects affecting, U.S.D.A.....	454	and calcium, ratio in the diet.....	565
local markets for, U.S.D.A.....	896	carbonate, diffusion in soils, Md.....	128
marketing cooperatively.....	789	chlorid, effect on activity of malt diastase	528
on Yuma reclamation project, U.S.D.A....	226	germination of seeds....	327
poisoning, notes, U.S.D.A.....	280	determination in foods.....	809
sanitary officers, list, U.S.D.A.....	770	plants.....	797
statistics, U.S.D.A.....	770	effect on <i>Aspergillus</i> spp.....	825
watering places, developing, U.S.D.A....	570	growth of tubercle bacilli.....	381
(See also Animals, Cattle, Sheep, etc.)		in Asiatic foodstuffs.....	64
Liver of bovines, studies.....	377	intake, effect on calcium retention by pigs	66
Livermore area, Cal., soil survey, U.S.D.A....	17	rôle in growth of fungi.....	28
<i>Lixus concavus</i> , biology.....	56	salts, effect on concrete.....	891
<i>junci</i> , notes and remedies.....	562	sulphate, effect on germination of seeds..	328
Locust hispa, notes, Md.....	353	use against tetanus, U.S.D.A.....	781
Locusts, destruction by natural enemies.....	354	Mahogany seedlings, flowering of.....	546
notes.....	252, 453	Maine Station, financial statement.....	194
Mont.....	652	notes.....	195, 699
Ohio.....	757	report.....	194
remedies, Ohio.....	793	University, notes.....	195, 397
Loganberries, culture, Oreg.....	148	Maize. (See Corn.)	
<i>Lophodermium brachysporum</i> , notes.....	851	Mal de caderas, immunity to.....	379
<i>Lotus corniculatus</i> , variation in.....	321	<i>Malacosoma americana</i> . (See Tent caterpil-	
Louping ill in sheep.....	681	lar.)	
<i>Loxostege similalis</i> . (See Garden webworm.)		spp., notes, Can.....	558
<i>sticticalis</i> , studies.....	54, 252	Maladie du coït. (See Dourine.)	

	Page.		Page.
Malaria, handbook.....	759	Mango bark borer, notes.....	457
transmission by mosquitoes.....	856	fruit fly, notes.....	453
Malic acid, determination in roselle.....	161	Mangoes, bacterial disease affecting.....	45
utilization by higher plants.....	423	culture in India.....	42
Malignant growths, treatment.....	476	propagation and grafting, Hawaii..	234
Mallein, effect on blood of horses.....	284	varieties, P.R.....	637
Mallophaga—		<i>Manihot glaziovii</i> , tapping experiments.....	843
affecting domestic animals in Australia..	757	Manila rope, manufacture.....	86
distribution and species forming among..	53	Manioc. (See Cassava.)	
Malt diastase as affected by chlorids.....	528	Mannitol in Fucus and Laminaria.....	566
extract, homemade, for nursing mothers	162	Manometer, use in sap flow studies.....	422
saccharification by its own diastase....	505	Manual training in elementary schools.....	297
sprouts, analyses.....	471	New Mexico.....	92
Ky.....	270	Manure—	
N.H.....	769	after effect.....	729
N.J.....	666	barnyard. (See Barnyard manure.)	
R.I.....	570	compensation for under tenancy.....	420
Wis.....	367	effect on apples, Pa.....	438
ash analyses, Ohio.....	861	composition of soils.....	416, 417
methods of analysis.....	311	foot-and-mouth disease virus... ..	283
Malta fever in goats, investigations, U.S.D.A.	780	soil temperature, Mich.....	620
notes.....	285	fermenting, effect on phosphates.....	23
Maltose, resorption in small intestine.....	268	liquid, fertilizing value.....	427
Malukang butter, detection.....	613	injurious to fish.....	821
<i>Mamestra trifolii</i> . (See Clover cutworm.)		treatise.....	820
Mammæ, inheritance in Duroc Jersey swine.	470	(See also Cow, Poultry, Sheep, etc.)	
Mammals, artificial impregnation of.....	66	Manuring, new basis for.....	516
fur-bearing, of North America.....	70	Maple phenacoccus, notes, Me.....	251
normal pulse rate of.....	66	sap, micro-organisms of, Vt.....	113, 115, 157
weight of lungs.....	476	scale, cottony, notes, Me.....	251
Man, heredity in.....	769	sirup, analyses.....	766
hog erysipelas affecting.....	780	Vt.....	115
immunization against tuberculosis.....	884	as affected by micro-organisms,	
insects affecting, Can.....	252	Vt.....	113
metabolism experiments.....	62, 164, 165	manufacture.....	208
purin metabolism in.....	63	remedying defects in, Vt.....	114
Manganese—		sugar, analyses.....	766
content of leaves.....	628	manufacture.....	208
determination in plants.....	797	sycamore, witches' broom affecting... ..	51
dioxid, effect on germination of seeds.....	528	Maranko, notes.....	461
effect on <i>Aspergillus fumigatus</i>	30	<i>Marasmius sacchari</i> , notes.....	647
formation of chlorophyll.....	323	sp., notes.....	152
legume bacteria.....	733	Marc, fertilizing value.....	129
in pineapple soils, Hawaii.....	210	Mares, care and management, Kans.....	873
occurrence in plants.....	28	racing performances and breeding	
rôle in growth of <i>Aspergillus niger</i>	219	value.....	773
sulphate, effect on castor-bean lipase....	713	<i>Margaropus annulatus</i> . (See Cattle ticks.)	
fertilizing value.....	151	Marion County, Mo., soil survey, U.S.D.A....	17
for grapes.....	838	Marketing, cooperative, papers on.....	595
Mange, parasitic, in horses, asses, and mules.	588	relation to cost of living.....	867
(See also Sheep scab.)		Markets, inspection in Virginia.....	766
Mangel aphids, notes.....	454	Marl, analyses.....	119
Mangels—		deposits in Virginia coastal plain.....	513
ash analyses, Ohio.....	861	effect on loamy sand.....	19
composition as affected by sodium salts,		greensand, analyses and use.....	513
R.I.....	420	Marmalades, judging.....	865
continuous culture.....	227	Marrow cabbage, cooperative experiments...	138
culture experiments.....	427	fertilizer experiments.....	632
fertilizer experiments.. 125, 213, 227, 228, 319,	830	Marrows, vegetable, notes.....	338
for cows.....	577	Marsh crops, culture and selection experi-	
heredity of sugar and dry matter in, Can.	270	ments.....	531
reducing and nonreducing sugars in.....	111	Marsupials, chromatin bodies in erythrocytes.	478
seeding experiments.....	432	Marx, Karl, theories of.....	491
Can.....	224	Massachusetts College—	
thinning experiments.....	432	notes.....	195, 300, 397
varieties.....	228, 530, 830	work of agricultural education department	296

	Page.		Page.
Mastitis in cattle, therapeutics of.....	500	<i>Megarhogas theretæ</i> n. sp., description.....	562
Materials of construction, treatise.....	890	<i>Megastigmus</i> , revision.....	458
May beetles, notes and remedies, U.S.D.A.....	561	<i>Megilla maculata</i> , notes.....	853
Maya, notes.....	59	<i>Melampsalta incepta</i> , notes.....	558
<i>Mayetiola destructor</i> . (See Hessian-fly.)		<i>Melampsorella elatina</i> , notes.....	451
Meadow fescue, culture experiments.....	631	<i>Melanconium sacchari</i> , notes.....	647
varieties.....	139	<i>Melanospora parasitica</i> , notes.....	46
lark, feeding habits, U.S.D.A.....	452	<i>Melanotus communis</i> , notes.....	252
notes, U.S.D.A.....	696	<i>Melanozantherium antennatum</i> n. sp., descrip- tion, Me.....	654
western, economic value, Cal..	52	<i>Melinis minutiflora</i> , culture, P.R.....	631
Meadows, culture experiments.....	331	<i>Melittomma insulare</i> , notes.....	853
in Siegerland.....	589	Melon aphid, studies, Okla.....	355
fertilizer experiments.....	530, 632	Melons, Monketoan, as a cattle food.....	569
irrigation experiments.....	627	notes.....	338
liming experiments.....	331	parthenogenesis in.....	837
seeding and reseeded, Vt.....	736	<i>Melophagus ovinus</i> . (See Sheep tick.)	
(See also Grasses.)		<i>Melospiza melodia</i> , destruction of grain aphids by, U.S.D.A.....	453
Meals, planning and serving.....	898	Mendelian formulas, simplification.....	68
Measles in cattle, U.S.D.A.....	782	ratios, test of goodness of fit.....	67
sheep, U.S.D.A.....	887	Mendelism, discussion.....	67
Measures and weights, inspection, Nev.....	266	Menhaden industry, notes.....	318
Meat and bone scrap, analyses, R.I.....	570	Mental work, effect on metabolism.....	768
chemical changes during vacuum dry- ing.....	58	Menus for boys.....	464
chopped, detection of added water in.....	460	Mercury oxid, effect on germination of seeds.....	528
cost of production in Argentina.....	870	vapor lamp, photochemical effects.....	218
fertilizing value.....	129	<i>Meria laticis</i> , notes.....	156
from tuberculous animals, sterilization.....	460	<i>Meromyza americana</i> , notes.....	252
frozen, studies.....	659	<i>Merulius lacrymans</i> , studies.....	157, 852
trade of Australia.....	770	sclerotium, description.....	554
ingestion, effect on children.....	365	<i>Mesembrianthemum mahoni</i> roots as a yeast substitute.....	460
residual nitrogen in blood.....	767	Metabolism—	
inspection, U.S.D.A.....	566	as affected by light.....	567
light and dark, effect on uric acid excre- tion.....	663	during mental work.....	768
meal, analyses, N.H.....	769	experiments with animals.....	62
N.J.....	666	dogs.....	165
methods of analysis.....	311	ducks.....	171
poisoning, control.....	564	men.....	62, 164, 165
preparations, analyses.....	58	fats and carbohydrates in.....	269
preservation with nascent ozone.....	566	in infants, mineral salts in.....	366
preservative containing benzoic acid.....	266	of calcium and phosphoric acid in infants.....	166
price of in Barcelona.....	162	diet poor in nitrogen.....	165
products, detecting blackleg infection in.....	882	organic phosphorus compounds.....	166
inspection, U.S.D.A.....	566	purin, studies.....	365
preservation.....	312	relation to thyroid secretion.....	868
scrap, analyses, Vt.....	769	Metal reinforcement, corrosion in concrete.....	687
Wis.....	567	Metals, detection in ethyl alcohol.....	312
supply and distribution in New South Wales.....	862	<i>Metamastus hemipterus</i> , notes, P.R.....	52
of United States.....	770	spp., affecting coconut palms.....	858
U.S.D.A.....	896	Metaphosphate, assimilation by plants.....	624
trade of Australia.....	666	<i>Metarrhizium anisopliae</i> , notes P.R.....	52, 53, 652
use in the dietary, Ohio.....	862	use against sugar cane pests.....	846
Mechanical colleges. (See Agricultural col- leges.)		Meteorological—	
Mecklenburg County, N. C., soil survey, U.S.D.A.....	16	observations—	
<i>Medicago falcata</i> seeds, germination, S.Dak.....	331	Alaska.....	722
Medical commissions, relation to pure milk, U.S.D.A.....	878	Mass.....	121, 415, 722, 812
Medicine, use of "normal" frequency curve in.....	168	Me.....	121
Mediterranean flour moth, destruction by heat.....	856	Mont.....	616
notes.....	655	N.Dak.....	209, 415
		N.H.....	722
		N.Y.State.....	812
		Ohio.....	722
		U.S.D.A.....	120, 209, 510, 721, 812

Meteorological—Continued.	Page.	Micro-organisms—Continued.	Page.
observations—continued.		in soil.....	122, 123
Va.....	616	as affected by cold.....	316
Wyo.....	812	pathogenic, transmission by stable flies.....	760
at Plots Experiment Station.....	813	penetration of eggshells by.....	765
University of California, U.S.D.A.....	121	reduction of stains by, Va.....	611
in Alberta.....	15	relation to organic soil constituents.....	817
Hamburg.....	314	rôle in utilization of mineral phosphates.....	870
Havana.....	813	(See also Bacteria.)	
Iowa.....	812	<i>Microterys flavus</i> , notes.....	654
Philippines.....	813	<i>Microtus agrestis</i> , control in France.....	651
Russia.....	509	Middlings, analyses.....	467, 769
(See also Climate, Rain, Weather, etc.)		Ky.....	270
conditions, relation to—		R.I.....	570
growth and yield of oats.....	509	Wis.....	367
plant diseases.....	44	(See also Wheat, Oat, Rye, etc.)	
elements, relation to soil temperature,		Mignonette, heredity of self-sterility in.....	136
Mich.....	618	Milichiinae, synopsis.....	657
Meteorology—		Milk, abortion bacillus in.....	282, 305, 500
and agriculture, paper on.....	120	U.S.D.A.....	778
agricultural, in France.....	510	acid and rennet test, comparison,	
Russia.....	314, 510	U.S.D.A.....	75
review of literature.....	811	acidity.....	579
dynamic, U.S.D.A.....	314	determination.....	807
in the Far East, U.S.D.A.....	121	U.S.D.A.....	75
International catalogue.....	510	adulteration, detection.....	376, 612
problems in, U.S.D.A.....	314	analyses.....	59, 206, 207, 673
relation to agriculture.....	314	analysis, casein media for, U.S.D.A.....	718
treatise.....	615	anaphylactic reaction.....	612
Meteors, notes to observers of, U.S.D.A.....	121	as affected by cold storage.....	268
<i>Meteorus ictericus</i> , notes.....	562	cooking.....	160
sp., notes, U.S.D.A.....	455	pasteurization, U.S.D.A.....	109
Methyl alcohol, detection in ethyl alcohol.....	312	bacteria, activity under neutralized	
determination.....	411, 810	conditions.....	877
pentose, determination in grapes and		counting.....	206
wines.....	205	studies.....	173
Methylene blue, bactericidal action.....	882	bacterial content.....	279
use against tuberculosis.....	481	N.Y.State.....	279
Mica as a source of potash.....	215	determination, U.S.	
Mice, feeding experiments.....	767	D.A.....	717
field, control in France.....	651	bacteriology of.....	775
immunity against anthrax bacillus.....	378	biological examination.....	172
immunization against trypanosomes.....	379	boiled v. raw, studies.....	360
Michigan College, notes.....	300	buffalo's, analyses.....	278
Station, notes.....	300, 397	care on the farm, Nebr.....	71
Microbial diseases, treatise.....	476	cellular elements in.....	278
<i>Microbracon hyslopi</i> n. sp., description.....	563	certified, production, U.S.D.A.....	878
<i>vestitica</i> n. sp., description.....	563	champagne, preparation.....	475
<i>Microcera</i> sp., parasitic on citrus white fly,		chemistry, progress in 1912.....	805
Fla.....	251	chocolate, methods of analysis.....	799
Micro-chemistry, text-book.....	801	coagulation by rennet, Vt.....	775
<i>Micrococcus</i> —		in the stomach.....	360
<i>melitensis</i> , agglutination of different		coloration of reagents by.....	412
strains.....	581	composition.....	775
investigations, U.S.D.A.....	780	composition—	
<i>mucofaciens</i> , in milk.....	376	as affected by feeding stuffs.....	277, 374, 776
<i>paramelitensis</i> , identification.....	582	at different stages of milking.....	374
<i>roseus</i> , notes, Vt.....	157	diurnal variation in.....	375
<i>tetragenus</i> , notes.....	179	monthly variation in.....	673
<i>tritici</i> , notes.....	243	condensed, analyses.....	674, 880
<i>Microdus inedius</i> , notes, U.S.D.A.....	455	bacterial infection, Vt.....	777
Micro-organisms—		manufacture and impor-	
decomposition of foods by.....	564	tance, U.S.D.A.....	476
effect on solubility of phosphates.....	423	standards, U.S.D.A.....	777
fixation of nitrogen by.....	819	condensing factories in Norway.....	897
in fresh eggs.....	765	control in stores, U.S.D.A.....	776
maple sap, Vt.....	113, 115, 157	unions in Denmark.....	278

	Page.		Page.
Milk, cost of production.....	278, 673	Milk records, systems for in various coun-tries.....	673
Mass.....	876	relation to tuberculosis.....	499
desiccated, manufacture and impor- tance, U.S.D.A.....	476	sanitary, production.....	463, 473
treatise.....	777	relation to barns.....	500
determination of bacterial content, U.S.D.A.....	75	scales, use, Cal.....	71
dried, testing.....	876	serum, preparation.....	800, 806
emulsion, for calves.....	369	refraction of.....	612
enzym action in.....	775	skimmed. (<i>See</i> Skim milk.).....	
excretion of tubercle bacilli into.....	583	slime-making bacteria in.....	376
fat as affected by temperature.....	580	sour, use against diarrhea in chicks, Conn.Storrs.....	288
content as affected by—		souring under neutralized conditions...	877
method of milking.....	373	standards, U.S.D.A.....	777
milking machines, S.Dak.....	774	sterilization.....	280
globules, casings of.....	806	by electricity.....	580
studies.....	579	stores, score card for, U.S.D.A.....	776
yield, relation to body weight.....	374	substitutes, notes.....	174, 668
(<i>See also</i> Fat.).....		supply, control, U.S.D.A.....	776
first-drawn and last-drawn, composi- tion.....	474	enzym method.....	477
food value.....	564	of Milwaukee.....	280
for calves, Ill.....	771	New York City.....	473
from cows affected with streptococcic mastitis.....	206	small cities, improvement, N.Y.State.....	473
diseased animals, detection.....	480	testing.....	876
newly lactating animals, detection.....	477	Kans.....	879
vaccinated cows, tubercle bacilli in.....	583	handbook.....	206
germ content, factors affecting, N.Y. State.....	878	systems in various countries...	673
goat's, composition.....	376	tests, comparison, U.S.D.A.....	717
heated, detection.....	612, 806	Va.....	611
digestibility.....	662	use in the dietary, Ohio.....	862
homogenizing experiments.....	879	watered, detection.....	806
human, antibody content.....	778	yield as affected by milking machines, S.Dak.....	774
as affected by cooking.....	160	Milking machines, sterilization and efficiency, N.Y.Cornell.....	578
fat content.....	278	tests, S.Dak.....	774
hemagglutinins in.....	175	methods.....	373
hygiene, treatise.....	877	Mill insects, destruction by heat.....	253
infectious diseases of.....	473	Millet—	
inspection, weaknesses of.....	580	absorption of organic nitrogen by.....	628
judging.....	206	broom corn, culture in Texas Panhandle, U.S.D.A.....	429
methods of analysis.....	278, 809	culture, Ariz.....	426
examination, Va.....	611	experiments, U.S.D.A.....	137
mineral salts content.....	366	effect on nitrate content of soils, N.Y.Cor- nell.....	818
modified, coagulation in the stomach...	360	fertilizer experiments.....	625
pasteurization.....	675	growth as affected by meteorology.....	510
U.S.D.A.....	73, 109	hay, ash analyses, Ohio.....	861
pasteurized, cheese from.....	674	pearl, culture in Porto Rico, P.R.....	631
U.S.D.A.....	475	polish meal, methods of analysis.....	311
for young animals.....	287	rock phosphate for.....	418
pathological, detection.....	612	water requirements, U.S.D.A.....	826
peroxidase test, studies.....	311	Milling, invisible loss in, N.Dak.....	661
powder, analyses.....	476, 880	Mills, fumigation, Ky.....	640
manufacture.....	475	Milo maize as a dry land crop, Ariz.....	736
production and handling, Cal.....	71	culture experiments, Nebr.....	225
factors affecting.....	577	U.S.D.A.....	429
improvement.....	578, 673	fertilizer experiments, U.S.D.A..	32
in Norway.....	897	for pigs, Ariz.....	468
of Ayrshire cows.....	876	yields, Ariz.....	426
relation to form and weight.....	473	U.S.D.A.....	32
products, food value.....	564	Mineral matter, importance in food.....	366
raw, digestibility.....	662	oil as affected by added oils.....	488
reaction.....	806, 807	waters, analyses, N.Dak.....	866
recipes.....	564	of Illinois, classification.....	617
records, interpretation.....	775		
studies.....	577		

	Page.		Page.
Mines, humidity of air in, U.S.D.A.....	121	Moor plantations, machinery for.....	488
Minks, breeding for fur.....	673	soils. (See Soils, moor.)	
feeding and management.....	70	Moors, upland, formation.....	124
Minnesota Field Crop Breeders' Association..	830	<i>Morchella esculenta</i> , prevalence in South	
Station, notes.....	794	Africa.....	461
University, notes.....	196, 794	Morning-glories, spotting by raindrops.....	752
Miso, cleavage products of.....	565	Mortars, tests.....	786
Mississippi College, notes.....	300, 397	Mosquitoes—	
Station, notes.....	300	anopheline, remedies.....	759
Missouri Fruit Station, financial statement..	599	detecting flight of.....	656
notes.....	699	extermination.....	293
report of director....	599	of North and Central America and West	
Station, financial statement.....	696	Indies, treatise.....	357
notes.....	699	Transvaal.....	476
report of director.....	696	salt marsh, control, N.J.....	559
University, notes.....	97, 699	studies, Hawaii.....	252
Mistletoe, growth on monocotyledons and		yellow fever, notes, U.S.D.A.....	656
succulent conservatory plants..	352	Mosses, eradication, Vt.....	741
red fruited, infection experiments.....	243	Motor plows. (See Plows.)	
Mites, natural enemies of.....	262	power v. horses, treatise.....	388
Mitochondria, relation to anthocyanin forma-		trucks, effect on road surfaces, U.S.D.A.....	388
tion.....	827	v. horses, comparison.....	489
rôle in heredity.....	67	vehicle laws and regulations.....	291
Mock suns, U.S.D.A.....	812	vehicles, new fuel for.....	184
Moisture, effect on fumigation, N.Y.State....	762	Motors and dynamos, treatise.....	892
(See also Water.)		electric, service tests.....	892
Molasses—		Mountain slopes, climatic influence, U.S.D.A..	414
analyses.....	570	Mowrah butter, detection.....	613
beet pulp. (See Beet pulp.)		Mucin, occurrence in plants.....	308
feed, analyses.....	467	<i>Mucor mucedo</i> in tamari-koji.....	161
N.H.....	769	Mucors, identifying sex in.....	216
N.J.....	666	Mud, fertilizing value.....	129, 625
Vt.....	769	Mulberry diseases, notes.....	243
methods of analysis.....	311	Mule breeding in Sao Paulo.....	368
nutritive value.....	65	Mules, maintenance tests with oat hulls, Md..	367
for live stock.....	570	Muriate of potash. (See Potassium chlorid.)	
grass, culture in Porto Rico, P.R.....	631	<i>Mus rattus</i> , bacterial disease of.....	58
mercuric acetate precipitate from.....	614	spp., notes.....	158
nutritive value.....	65	<i>syvaticus</i> , control in France.....	651
U.S.D.A.....	460	<i>Musa textilis</i> fiber, strength of, U.S.D.A.....	313
Mold fungi, assimilation of salts by.....	28, 29, 30	<i>Musca domestica</i> . (See House flies.)	
relation to iodine compounds.....	133	Muscadine, use against sugar-cane pests....	846
Molds, penetration of egg shells by.....	765	Muscle from fasting dogs, composition.....	664
relation to organic soil constituents..	817	Muscles, purin bases in.....	366
Mole cricket, parasites of.....	653	Muscovite, fertilizing value.....	625
studies, Ga.....	557	Muscular—	
<i>Monascus heterosporus</i> , relation to rubber		contraction, determination of efficiency..	568
spotting.....	451	energy, origin.....	466
<i>Monilia candida</i> , experimental propagation..	858	work, effect on carbon dioxid excretion..	569
<i>fructigena</i> , sclerotia of.....	445	gaseous metabolism.....	167
<i>linhartiana</i> , notes.....	50	women.....	568
<i>vini</i> n. sp., notes.....	116	Museum, educational, at Clark University...	898
Monkeys, chromatin bodies in erythrocytes..	478	Muskmelon wilt, notes.....	847
<i>Monoblastus caliroæ</i> n. sp., description.....	563	Muskmelons, culture experiments, Vt.....	743
Monocalcium paracaseinate, formation in		Muskkrats, parasites of.....	484
cheese, N.Y.State.....	11	Mustard and lupines, continuous culture....	431
<i>Monodontomerus areus</i> , notes, Me.....	252	growth in shade, U.S.D.A.....	130
<i>Monomorium pharaonis</i> , trail formation and		oil, detection.....	613
orientation.....	860	value in the diet.....	664
Monosaccharids, absorption in the intestines.	268	varieties.....	228
Monroe County, N. Y., soil survey, U.S.D.A..	16	white, fertilizer experiments.....	632
Montana College, notes.....	97, 397, 600	Musts, analyses.....	119
Fergus County substation, report..	696	fermentation.....	119
Station, financial statement.....	696	Mutton—	
notes.....	97, 397, 600	ash analyses, Ohio.....	861
report of director.....	696	consumption in United States, U.S.D.A..	770
Moon, effect on weather.....	314	cost of production.....	572

	Page.		Page.
Mutton—Continued.		<i>Neofabra malicorticis</i> , description, Oreg.....	153
dietary value and digestibility, U.S.D.A.	159	<i>Neosigniphora nigra</i> n. sp., description.....	359
production.....	469	Nepheline, fertilizing value.....	625
recipes, U.S.D.A.....	159	<i>Nepticula sericopeza</i> , notes.....	759
tapeworm cysts in, U.S.D.A.....	886	<i>Nereocystis luetkeana</i> , distribution.....	322
<i>Myceliophora sulphurea</i> , optimum culture		Nerve fiber, chemical changes in.....	466
medium for.....	220	Nevada Station, financial statement.....	194
<i>Mycogone</i> sp., relation to rubber spotting....	451	notes.....	300, 900
Mycology, bibliography.....	626	report of director.....	194
Mycophenolic acid in corn, U.S.D.A.....	8	University, notes.....	300, 900
<i>Mycosphaerella</i> —		New Hampshire College, notes.....	98, 699
<i>citrullina</i> , inoculation experiments.....	847	Station, financial statement.....	793
<i>pinodes</i> , notes.....	645	notes.....	699
relation to <i>Septoria pisi</i>	447	report of director.....	793
Myiasis in cattle, notes.....	482	New Jersey College, notes.....	498
<i>Myonyssus decumani</i> , occurrence in Rhode		Stations, notes.....	498
Island.....	755	New Mexico College, notes.....	196, 398
Myriapoda, studies and bibliography.....	58	Station, notes.....	398
<i>Myricocentrum scirpi</i> n. g. and n. sp., studies..	345	New York Cornell Station, notes.....	196, 398
<i>Myrmelachista ambigua ramulorum</i> , notes,		Food Investigating Commission..	868
P. R.....	642, 652	State Station, financial state-	
<i>Myrmica scabrinodis sabuleti</i> , embryology....	860	ment.....	899
<i>Myzosporeum</i> sp., notes.....	49	notes.....	196
<i>Myzine sexcincta</i> , notes.....	58	report.....	899
Nagana, immunity to.....	380	Nickel, occurrence in lard substitute.....	459
Nana wood, notes.....	443	Nicotiana, abnormal development of.....	321
<i>Napomyza chrysanthemi</i> , remedies.....	55	hybrids, heredity of flower size in.	216
Naras, description.....	60	studies.....	320
Natal grass, yields, Fla.....	224	Miss.....	320
National Educational Association.....	399	Nicotin content of tobacco plants.....	503
Serum Institute of Holland, reports.....	377	determination.....	810
Natural selection in beans.....	139	extraction from tobacco.....	118
Nature study, course for teachers.....	298	Nicotinic acid, occurrence in rice bran.....	263
in elementary schools.....	394	Nigella, floral anomalies in.....	629
lessons in.....	395	Night soil, preservation.....	731
manual.....	495	Nipa palm, alcohol from.....	414
Nebraska Corn Improvers' Association.....	534, 633	Nitragin, tests.....	733
Station, financial statement.....	793	Nitrate—	
notes.....	97, 397, 795	deposits in Chile.....	517
report.....	793	industry in Norway.....	126
University, notes.....	97, 397, 795	Norwegian. (<i>See</i> Calcium nitrate.)	
Necrobacillosis in cattle.....	500	of lime. (<i>See</i> Calcium nitrate.)	
sheep.....	783	of soda—	
Necrosis bacillus, studies.....	478	after effects.....	127
Nectarines—		application at different depths.....	126
composition as affected by irrigation,		effect on disease susceptibility in ce-	
Idaho.....	236	reals.....	844
correlation between flower and fruit.....	424	flow of rubber latex.....	748
<i>Nectria bainii</i> , notes.....	548, 749	germination of seeds.....	328
<i>ditissima</i> , notes and treatment, N. C.....	49	soils.....	417
<i>graminicola</i> , notes.....	47, 445	fertilizing value.....	23, 125, 213, 321, 632, 829
<i>ipomææ</i> , relation to sweet potato stem		Ala. College.....	831
rot.....	647	Alaska.....	727, 735
<i>laurentiana</i> , notes.....	647	N. H.....	736
<i>theobromææ</i> , notes.....	155	for mangels.....	830
<i>Nectriella cucumeris</i> n. sp., description.....	245	loss from soils, Fla.....	211
Negri bodies in rabies.....	379	manufacture, progress in.....	730
photomicrographs of.....	478	production and use.....	126, 213, 517
Nelsonite, utilization.....	519	use against mosses, Vt.....	741
Nematocera, blood-sucking, of Brazil.....	54	reduction in Nebraska soils.....	734
of British India, treatise.....	57	shales, analyses.....	318
Nematodes injurious to clover.....	446	Nitrates—	
musk rats.....	484	artificial, production and use.....	517
relation to leaf spot of cereals.....	47	behavior in cultivated soils.....	515
treatment.....	151	determination in soils.....	797
<i>Nematus erichsonii</i> , notes, Can.....	252	Va.....	610
Neocosmospora, notes.....	444	effect on apples, Pa.....	438

Nitrates—Continued.	Page.	Nitrogen—Continued.	Page.
formation from peat nitrogen.....	624	residual, in blood before and during ab-	
in soils, N.Y. Cornell.....	818	sorption of food.....	767, 768
in Colorado soils.....	819	soluble, as a factor in judging flour.....	60
loss from soils.....	315	Nitrogenous—	
origin and distribution in soils, Colo.....	621	compounds, effect on legume bacteria....	733
Nitric acid, determination in foods.....	809	in soils, solubility.....	108
manufacture from ammonia.....	517	constituents of leaves, displacement by	
the air.....	822	water.....	218
Nitrification—		lime juice.....	161
as affected by alfalfa and timothy.....	317	fertilizers, availability.....	126
in arid soils.....	21, 211	comparison.....	23, 125, 213
Colorado soils, Colo.....	621	production and use.....	517
soils as affected by copper salts.....	529	relation to citrus die-back, Fla.....	248
studies, N.C.....	21	valuation.....	821
Virginia soils, Va.....	621	products, absorption.....	465
Nitrites, assimilation by mold fungi.....	29	soil constituents, effect on plant growth..	219
determination in soils.....	797	Nitrous acid, detection in ethyl alcohol....	312
Nitrogen—		Nodular worm, life history and structure....	476
ammonia, determination in water.....	617	<i>Nolina microcarpa</i> , notes, Ariz.....	441
fixation by permutite and clay		Nonhalophytes, variations in salt content....	28
soils.....	127, 517	<i>Norbanus</i> sp., notes.....	458
utilization in protein meta-		North Carolina College, notes.....	498, 900
bolism.....	62	Station, financial statement..	95
assimilation by <i>Azolla</i>	133	report of director....	95
fungi.....	824	Stations, notes.....	498
leguminous plants.....	326	North Dakota College, notes.....	196, 700
atmospheric—		Station, notes.....	700
abnormal fixation.....	819	Williston substation, report..	299, 496
fixation.....	517, 730	<i>Nosema apis</i> , studies.....	761
by <i>Azotobacter</i>	227	Noxubee County, Miss., soil survey, U.S.D.A..	219
boron compounds.....	822	Nucleic acid, effect on plant growth.....	16
feldspar.....	518	Nucleus, rôle in heredity.....	66
legume bacteria, Va.....	629	Nun moth, dipterous parasites of.....	759
treatise and bibliography....	417	Nursery—	
utilization.....	126, 319, 821	industry in Utah.....	342
determination.....	796, 807	inspection—	
in meat products.....	800	in Arizona.....	341
soils.....	317	Canada, Can.....	252
urine.....	508	Tennessee.....	653
effect on carnations and roses.....	840	Utah.....	342
variation of tomatoes and beans,		law in Arkansas, Ark.....	641
Md.....	339	Kentucky, Ky.....	641
fixation by alumina and carbon.....	417	Missouri, Mo.....	838
barium oxid and charcoal....	822	laws and regulations in United States	
micro-organisms.....	819	and Canada.....	746
plants.....	133	practice, notes.....	838
zeolites.....	211	stock, fire blight affecting, N.Y. Cornell.	348, 551
in Colorado soils, Colo.....	621	fumigation, Ky.....	640
Nebraska soils.....	734	transportation law, Ark.....	641
review of literature, U.S.D.A....	527	Nut industry in California.....	639
rôle of alumina in.....	24	kernels, extraction, cleaning, and utiliza-	
in rain and snow, Can.....	209	tion.....	660
soils as affected by cultivation and ma-		Nutrition—	
nuring.....	417	animal. (See Animal nutrition.)	
notes and bibliography.....	316	coefficient of school children.....	364
lime. (See Calcium cyanamid.)		effect on amylase content of human sa-	
loss from soils.....	227	liva.....	568
minimum, physiological, studies.....	164	investigations at Carnegie Institution....	270
nutrition in plants, studies.....	628	mineral elements in, Ohio.....	862
organic, absorption by millet.....	628	plant. (See Plant nutrition.)	
determination of activity.....	796	problems, discussion.....	665
peat, formation of nitrates from.....	624	treatise.....	266
penetration into plants.....	732	(See also Digestion, Metabolism, etc.)	
permutite, assimilation by plants.....	127, 517	Nuts, insects affecting.....	354
ratio as a criterion of quality in flour....	460	soaking.....	60, 264
relation to fruit-bud formation.....	539	<i>Nysius angustatus</i> , notes.....	252

	Page.		Page.
<i>Nyctius senecionis</i> , notes.....	854	Oats, irrigation experiments, Nev	138
Oak high forests on the Rhine, yield tables ..	747	U.S.D.A.	32
Oidium, studies and bibliography	553	liming experiments, Can.....	223
tortrix, notes	558	nematodes affecting	151
worm, orange striped, notes, Md	353	omission of color factor in.....	739
Oaks, periodicity in	442	peptic digestibility	164
Oat chaff, analyses	467	rock phosphate for	418
crown rust, winter resistance of uredo- spores	645	seeding experiments	426
dry spot, notes	151	Can.	223, 224
flour, analyses, Can	270	N.Dak.	425
grass, culture experiments	631	Nebr.	225
tall, as affected by number of cut- tings	431	Ohio	36
varieties	139	U.S.D.A.	429
yields, Mont	631	sprouting for poultry, U.S.D.A.	696
hay, analyses	467	value in the diet	660
hulls, analyses, Can	270	varieties	138, 228, 530, 738, 831
N.J.	666	Ala.College	831
digestibility, Md.	367	Alaska	735
products, analyses, Wis	367	Can.	222
smut, notes, Ala. College	831	N.C.	31
Oats, analyses, Wis	367	N.Dak.	225, 425
anatomical investigations	831	Nebr.	225, 736
as affected by meteorological conditions ..	509	Ohio	31, 36, 137
ash analyses, Ohio	861	U.S.D.A.	428
breeding experiments	138, 532	water requirements, U.S.D.A.	826
cost of production, N.Dak	690	wild, germinative qualities	135
culture	830	studies	337, 538
experiments	427, 632	yields, Nev	138
Ala.College	831	U.S.D.A.	32
Alaska	735	as affected by water table	427
Ariz.	426	Ochthiphilinae, synopsis	657
Mont	630	<i>Odontopharynx longicaudata</i> n. g. and n. sp., notes	360
N.Dak	425	<i>Ecanthus</i> spp., notes	354
Nebr.	225	<i>Enothera</i> , biennial habit, constancy	424
Ohio	36	gigantism and tetraploidy in	321
in Nebraska	534	<i>Enothera lamarckiana</i> , origin	135
Texas Panhandle, U.S.D.A.	429	<i>Esophagostomum columbianum</i> , life history and structure	476
drawings of	141	spp., notes	287
effect on nitrate content of soils, N.Y. Cornell	818	<i>Estrus macropi</i> n. sp., notes	761
fertilizer experiments	23, 126, 127, 211, 213, 225, 318, 518, 624, 821	ovis, life history and remedies	761
Ala.College	831	notes	856
Alaska	727, 735	Ohio State University, notes	98, 398, 700
Ohio	728	Station, anniversary	106
floral anomalies in	629	financial statement	793
for summer silage	473	notes	98, 196, 398, 700
germination—		report of director	793
as affected by fertilizers	327	<i>Oidium caricæ</i> , notes	243
fungicides	346	<i>ericinum</i> , notes	49
energy of	538	Oil cake for cows	577
tests	740	meal, methods of analysis	311
Can	223	cakes, methods of analysis	311
germinative ability and vegetative force ..	740	determination in grains	507
green, analyses	467	emulsion, preparation and use, Ala.Col- lege	585
ground, analyses, N.J.	666	insecticides, effect on citrus fruits	354
Vt.	769	meal, analyses	467
growth as affected by fertilizer salts	329	Wis.	367
meteorology	510	of cloves, determination	798
on volcanic ash, Alaska	726	lavender, detection in ethyl alcohol	312
hulled, investigations	141	rosemary, detection in ethyl alcohol	312
hybridization v. selection in	635	tractors for the farm	893
improvement by selection	532, 535	Oils, chemical technology of	413
irrigation experiments	632	effect on concrete	184, 891
N.Dak	226	essential, determination in spices, etc. ...	309
		etheral, in spruce wood	504

	Page.		Page.
Oils for internal combustion engines.....	892	Orange maggot, notes.....	759
hydrogenation.....	413, 459	melanose, investigations, Fla.....	242
laboratory handbook.....	811	peel, pectins of.....	608
mineral, as affected by added oils.....	488	rot, studies, U.S.D.A.....	248
miscible, effect on dormant trees.....	354	Oranges, changes in during ripening, Fla.....	641
oxygen absorption by.....	613	culture.....	745
vegetable, bromin absorption by.....	612	Florida, composition, U.S.D.A.....	462
hydrogenation.....	413	packing experiments, P.R.....	637
of India.....	413	sugar and acid content, Fla.....	641
wood preserving, antiseptic tests.....	111.	Orang-outangs, chromatin bodies in erythro-	
Oklahoma College, notes.....	196, 398, 900	cytes of.....	478
Station, notes.....	398	Orchard—	
Okra, insects affecting.....	653	grass as affected by number of cuttings... 431	
Oleaginous fruits, formation of fats in.....	201	culture experiments.....	631
Oleander canker, description and treatment..	156	in the Ozarks, Mo.....	427
scale, notes.....	654	seed, adulteration and misbrand-	
Oleaster, Russian, notes, Ariz.....	441	ing, U.S.D.A.....	144
Oleomargarine law in Illinois.....	61	seeding experiments on ranges,	
manufacture.....	770	U.S.D.A.....	531
Olive oil, bleaching and decolorization.....	118	varieties.....	139
detection.....	613	yields, Mont.....	631
production in Spain.....	439	heaters, tests, Oreg.....	147
Olives as affected by cold storage.....	340	industry in California.....	639
culture, Ariz.....	426	South Australia.....	837
preservation by lactic-acid fermenta-		Utah.....	342
tion.....	117	inspection. (See Nursery inspection.)	
production in Spain.....	439	survey in Ontario.....	41
Onion flies, notes, U.S.D.A.....	454	Orchards—	
maggot, imported, notes, U.S.D.A.....	454	apple. (See Apple orchards.)	
smut, description and treatment.....	245	cover crops for.....	395
spot disease, treatment.....	245	Nev.....	147
thrips, description and remedies,		culture on Yuma reclamation project,	
U.S.D.A.....	453	U.S.D.A.....	226
notes.....	252, 558	demonstration, rôle in horticultural edu-	
Onions, ash analyses, Ohio.....	861	cation.....	41, 94
Bermuda, culture experiments, Can.....	235	insects affecting, Oreg.....	158
composition as affected by sodium		irrigation and drainage.....	745
salts, R.I.....	419	management, N.Y. State.....	339
culture experiments, U.S.D.A.....	137	planting by use of explosives.....	183
in Burma.....	736	protection against frost, Nev.....	147
growth as affected by sulphur.....	215	rejuvenation, W.Va.....	745
insects affecting, U.S.D.A.....	453	spraying experiments.....	354
irrigation experiments, P.R.....	638	Me.....	145
sugar content as affected by drying,		Orchid corms or tubers, dried, analyses.....	463
R.I.....	419	Oregon College, notes.....	197, 300, 900
value in the diet.....	664	Station, notes.....	98, 197, 300
Ontario County, N.Y., soil survey, U.S.D.A..	16	Organic matter—	
Good Roads Association, proceedings.....	291	effect on soil temperature, Mich.....	619
<i>Ooencyrtus</i> sp., notes.....	658	increasing in soils, U.S.D.A.....	540
Oophorectomy, paper on.....	500	relation to micro-organisms in soils.....	315
<i>Oospora scabies</i> . (See Potato scab.)		Ornamental plants, shrubs, or trees. (See	
<i>Opatrum crenatum</i> , notes.....	858	Plants, Shrubs, and Trees.)	
sp., notes.....	853	Ornamentials, culture in western Nebraska... 546	
<i>Ophiobolus herpotrichus</i> , notes.....	244	<i>Ornithodoros megnini</i> , notes.....	476
sp., notes.....	243	<i>savignyi</i> , relation to recurrent	
<i>Ophtonectria coccicola</i> , notes.....	852	fever.....	479
Ophthalmic reaction, diagnostic value for		<i>Ornix geminatella</i> , notes.....	655
contagious abortion in cows.....	586	<i>Orobancha cumana</i> , notes.....	851
Ophthalmology for veterinarians, treatise....	377	Orthoclase, decomposition by bacteria.....	316
<i>Opisus</i> n. sp., description.....	359	Orthorrhapha, mouth parts and sucking appa-	
(<i>Utetes</i>) <i>anastrephæ</i> n. sp., notes, P.R..	652	ratus of.....	760
<i>Opuntia parvula</i> as a host of mistletoe.....	352	<i>Orthorrhinus kluggi</i> , injurious to roses.....	658
Orach, insect and arachnid enemies of.....	853	<i>Oryctes</i> spp., notes.....	858
Orange black rot, notes.....	248	Osage orange rubber, notes.....	546
gummosis, notes and treatment.....	351	Osiers, insects affecting.....	853

	Page.		Page.
Osmosis in soils.....	124	Paprika, origin and composition, U.S.D.A....	264
Osmotic pressure—		Para grass, yields, Fla.....	224
as an environmental factor in plants.....	627	rubber. (See Rubber.)	
determination.....	731	Paracasein—	
in leaves, induced variations in.....	134	compounds, composition and properties,	
plants, studies.....	133, 134, 828	N.Y.State.....	9
<i>Ostertagia bullosa</i> , notes.....	555	preparation and properties ..	805
Ostrich farming in Australia.....	575	preparation, N.Y.State.....	11
Ostriches, leucocytozoon infection of.....	476	Paraffin, preservation of eggs with	172
notes.....	172	Paralysis in—	
<i>Otiorhynchus rotundatus</i> , habits of.....	657	horses and cows due to ingestion of fodder..	780
<i>Ougeinia dalbergioides</i> , notes.....	443	lambs, relation to <i>Dermacentor venustus</i> ..	482
Ova, production of sperm iso-agglutinins by ..	167	Paranuclein, antigenic properties.....	174
Ovaries, development in fowls.....	874	Paraphenylenediamin, effect on milk.....	806
Oven, electrical, description.....	567	<i>Parasetigena segregata</i> , studies.....	760
Owl, little, economic importance.....	651	<i>Parasiorola cellularis</i> , notes, Hawaii.....	253
Ox warble fly, notes.....	761	Parasites, minute hymenopterous, handling ..	658
review of literature.....	856	notes.....	855
Oxalic compounds, effect on vegetation.....	49	(See also Animal parasites, etc.)	
Oxen, limb tendons of.....	570	Parathyroid glands of domestic animals.....	377
Oxidases, rôle in formation of pigments.....	219	Paratyphoid infection, relation to bacterial	
sugar beet curly top.....	550	food poisoning.....	64
U.S.D.A.....	48	infections, detection.....	881
Oxygen, absorption by oils.....	613	<i>Parlatoria blanchardii</i> , notes.....	255
respiratory chromo-		Parsnip, poison, toxicity, Nev.....	111
gens of plants.....	324	<i>Parthenium argentatum</i> , culture experiments,	
<i>Oryspirura mansonii</i> , treatment, Hawaii.....	784	Ariz.....	443
<i>Orysternus maximus</i> , notes.....	858	Parthenogenesis in various plants.....	837
Oyster—		<i>Paspalum dilatatum</i> , culture in Porto Rico,	
shell bark-louse. (See Oyster-shell scale.)		P.R.....	631
scale, life history and remedies.....	558	root disease of.....	152
notes, Me.....	251	<i>Passerculus sandwichensis savanna</i> , destruc-	
and remedies.....	758	tion of grain aphids by, U.S.D.A.....	452
shells, ground, diffusion in soils, Md.....	128	<i>Passiflora edulis</i> as a trap for fruit flies.....	657
Oysters, recipes.....	361	Pasteurellosis in sheep.....	179
Ozone, nascent, as a food preservative.....	566	Pasture crops, handbook.....	530
Packing-house products. (See Animal prod-		Pastures, fertilizer experiments.....	632, 728
ucts.)		fertilizers for.....	517
plants, inspection in Virginia.....	567	Pathology, papers on.....	676
Paddy. (See Rice.)		treatise and bibliography.....	174
Paint and oil law in South Dakota.....	567	Pavement specifications, handbook.....	387
mineral, deposits in Virginia costal		Pavements, rock asphalt, construction.....	591
plain.....	513	Pea blight, studies.....	447
Paints, analyses, N. Dak.....	866	tree, Siberian, culture in Alaska, Alaska.....	743
dry, insecticidal value.....	758	Peach and almond graft hybrid, description..	838
Paleobotany, bibliography.....	626	brown rot canker, studies.....	848
Palm cake, analyses.....	367	crown gall, inoculation experiments... ..	449
kernel oil, detection.....	613	diseases, notes and treatment, Md....	146
nut cake, analyses.....	467	juices, studies, Del.....	711
oil, detection.....	613	pollen, frost resistance of.....	437
Palms, sugar-producing, notes.....	149	rust, treatment.....	551
<i>Paltostoma torrentium</i> , notes.....	54	scale, West Indian, control in Italy... ..	854
<i>Pamphila dysmephila</i> , life history and habits.	655	skins, isolation of fat from.....	459
Pancreas diseases, diagnosis.....	268	stem canker, notes, Conn.State.....	547
ferments of.....	662	"stop back," relation to tarnished	
Pancreatic and gastric fat digestion in infants.	365	plant bug.....	354
juice of dogs, alkalinity.....	268	Peaches as affected by fertilizers.....	40
secretion, relation to fats.....	465	lime-sulphur mixture,	
Panhandle region, Tex., soil survey, U.S.D.A ..	16	Ark.....	640
<i>Papaipema nitela</i> . (See Stalk borer.)		composition as affected by irrigation,	
Papaya leaf disease, studies.....	848	Idaho.....	236
Papayas, breeding experiments, Hawaii.....	234	correlation between flower and fruit ..	424
grafted, possibilities, U.S.D.A.....	42	cost of production.....	439
Paper and pulp industry, bibliography,		culture in Argentina.....	541
U.S.D.A.....	119	the Ozarks, U.S.D.A.....	237

	Page.		Page.
Peaches, dried, preparation and use U.S.D.A.	462	Peas, germination as affected by fertilizers...	327
green, anaerobic respiration, N.Y.		tests, Can.....	223
Cornell.....	538	growth as affected by fertilizer salts....	329
new, descriptions, N.Y.State.....	838	hybridization experiments.....	433
reducing and nonreducing sugars in.	503	plant nutrients removed by.....	837
respiration in gases.....	135	preservation.....	312
summer spraying, Md.....	146	transformation of nitrogen by.....	133
varieties for Pacific Northwest.....	745	varieties.....	530
resistant to disease.....	246	Can.....	222
Peanut bacterial disease, notes.....	448, 646	Peat, analyses.....	119
bran and shells, methods of analysis..	311	dust, storage of apples in.....	641
cake, feeding value.....	869	fertilizing value.....	518
for cows.....	577	lands or soils. (<i>See</i> Soils, peat.)	
diseases, notes.....	347	nitrogen, formation of nitrates from....	624
fungus disease, treatment.....	748	Pecans, culture in Florida.....	542
oil, detection.....	613	new, descriptions, U.S.D.A.....	436
root rot, notes.....	445	shelled, industry in Texas.....	61
Peanuts, ash analyses, Ohio.....	861	Pectins of aucuba and sweet orange.....	608
culture in Burma.....	736	Pedigrees, uniform system for.....	665
insects affecting.....	347	<i>Pegomya brassicae</i> . (<i>See</i> Cabbage-maggot.)	
Mammoth and Spanish, comparison	230	spp., notes, U.S.D.A.....	454
rot bacteria affecting.....	345	Pelargoniums, notes.....	341
varieties.....	830	Pellagra, relation to corn.....	175
Pear blight beetle, notes, Oreg.....	158	meal.....	768
notes.....	247	sand flies.....	357
fire blight, notes, N. Y. Cornell.....	348	stable flies.....	756
Wash.....	848	Pemiscot County, Mo., soil survey, U.S.D.A.	17
fruit buds, winter injuries.....	41	<i>Pemphigus gravicornis</i> n. sp., description, Me.	654
juices, studies, Del.....	711	Penicillic acid, formation, U.S.D.A.....	7
psylla, notes, N.Y.State.....	355	<i>Penicillium</i> —	
remedies.....	354	<i>crustaceum</i> , resistance to toxic substances	734
rust, notes.....	155	<i>glaucum</i> in tamari-koji.....	161
treatment.....	50	penetration of eggshells by.....	765
slug, notes, Oreg.....	158	products of.....	817
thrips, notes.....	252	relation to iodine compounds.....	133
Pears, cost of production.....	439	<i>gratioti</i> n. sp., studies.....	844
dried, preparation and use, U.S.D.A..	462	spp., formation of tannase in.....	132
fertilizer experiments.....	539	studies, U.S.D.A.....	7
fibro-vascular system.....	542	<i>variable</i> , self-poisoning in.....	529
frost injuries.....	547	<i>Pennisetum spicatum</i> , description.....	59
greening of wood.....	649	Pennsylvania College, notes.....	398
growth as affected by meteorology.....	510	south-central, soil survey,	
insects affecting.....	756	U.S.D.A.....	16
keeping quality as affected by fertiliz-		Station, notes.....	398
ers.....	640	<i>Penttila</i> sp., notes, U.S.D.A.....	261
marketing cooperatively.....	392	Pentosan content of germinating seeds.....	525
new, descriptions, N.Y.State.....	838	Pentose, determination in grapes and wines..	205
U.S.D.A.....	436	Peonies, American Botrytis blight of.....	650
oriental, and their hybrids, N.Y.Corn-		herbaceous, culture in Alaska,	
nell.....	541	Alaska.....	743
packing.....	838	notes, U.S.D.A.....	194
parthenogenesis in.....	837	Pepper, culture in Burma.....	736
preservation.....	312	Mexico.....	41
reducing and nonreducing sugars in...	503	hybridization experiments.....	434
varieties for Australia.....	340	irrigation experiments, P.R.....	638
Pacific Northwest.....	745	parthenogenesis in.....	837
resistant to disease.....	246	red, composition, U.S.D.A.....	263
vegetable, notes.....	461	value in the diet.....	664
Peas, assimilation of organic phosphates by..	423	white, examination.....	463
cost of production, N.Dak.....	690	Peppermint, culture experiments.....	331
fertilizer experiments, N. Y.State.....	22	extract, methods of analysis.....	798
field, culture experiments, Alaska.....	735	Peptone, effect on determination of sugar..	613, 716
N.Dak.....	226	Perennials, hardy, treatise.....	840
varieties, Ariz.....	426	<i>Peridermium laricis</i> , description.....	554
Wash.....	32	spp., notes.....	451
water requirements, U.S.D.A.....	826	Conn.State.....	547
garden, new bacterial disease of.....	245	<i>Peridroma saucia</i> . (<i>See</i> Cutworm, variegated.)	

	Page.		Page.
Perilla cake, analyses.....	467	Phosphate—Continued.	
feeding value.....	467, 869	industry in Algeria.....	519
<i>Perilloides bioculata</i> , notes, U.S.D.A.....	455	insoluble, utilization by higher plants...	423
Permutite nitrogen, assimilation by plants. 127, 517		mining practice in Tennessee.....	517
<i>Peronia ferrugana</i> , notes, Me.....	252	of lime. (See Calcium phosphate.)	
<i>Peronospora cephalariæ</i> n. sp., studies.....	552	rock as affected by iron sulphid.....	419
<i>sparsa</i> , notes.....	650	dissolved. (See Superphosphate.)	
<i>viciæ</i> , notes.....	243	effect on tomatoes, Md.....	339
Peroxidase, active principle of.....	202	fertilizing value.....	418
as affected by alkalis.....	202	Ala.College.....	831
in milk as affected by heating....	310	N.C.....	31
notes.....	413	production in Florida.....	25
Persimmons—		1912.....	519
adaptation and variety tests, U.S.D.A....	41	Tunis, for peat soils.....	519
induction of nonstringency in.....	264	Phosphates—	
new, descriptions, U.S.D.A.....	436	as affected by fermenting manure.....	23
parthenogenesis in.....	837	mixtures, Wis.....	624
reducing and nonreducing sugars in.....	503	comparison.....	319, 418, 516, 519, 632, 797
<i>Pestalozzia</i> sp., notes.....	345	effect on apples, Pa.....	438
Petroleum products, effect on dormant trees. 354		conservation of pears.....	640
<i>Phacelia tanacetifolia</i> , culture and analyses....	535	proteolytic enzymes in yeast....	309
<i>Phaeosphaerella macularis</i> , notes.....	51	imports into Europe.....	319
Pharmacology for veterinarians, text-book..	580	in soils as affected by ignition.....	317
papers on.....	676	urine, conservation.....	317
Pharmacopœia, extra British.....	580	mineral, utilization by animals.....	870
<i>Phaseolus lunatus</i> , analyses.....	215	natural, utilization.....	520
Pheasant hybrids, sterility in.....	575	organic, as affected by micro-organisms..	423
Pheasants and fowls, hybridization experi- ments.....	575	precipitated, manufacture.....	418
<i>Phenacaspis eugenieæ</i> , notes.....	654	production and use in 1911.....	213
<i>Phenacoccus artemisiæ</i> , parasite of.....	359	raw, as affected by calcium nitrate and ammonium sulphate.....	318
spp., notes, Me.....	251	rôle in alcoholic fermentation.....	715
Phenol, disappearance from creosoted wood..	111	use in Victoria.....	214
oxidation by peroxidase.....	202	on New Zealand soils.....	730
use against tetanus.....	883	(See also Superphosphate.)	
Phenology, relation to fruit culture and agri- culture.....	15	Phosphatic slag—	
Phenolphthalein, detection in ethyl alcohol..	312	availability.....	797
Phenylalanin as a source of ammonia, Iowa..	723	composition.....	822
<i>Phidippus coloradensis</i> , notes, U. S. D. A.....	455	effect on germination of seed.....	328
<i>Philatatomyia insignis</i> , mouth parts and sucking apparatus of.....	760	fertilizing value.....	228, 233, 319, 418, 519, 632, 635, 737, 829
<i>Phlebotrophia mathesonii</i> , notes, Can.....	252	N.C.....	31
<i>Phlebotomus</i> , habits.....	856	for fruit trees.....	639
<i>Phleum pratense</i> . (See Timothy.)		grass lands.....	530
Phlox, culture in Alaska, Alaska.....	743	production and use in 1911.....	213
<i>Phoenicococcus marlatti</i> , notes.....	255	soluble silicic acid in.....	409
Phoenix skipper, life history and habits.....	655	valuation.....	823
<i>Phoma batataæ</i> , notes, U.S.D.A.....	153	Phosphoric acid—	
<i>betæ</i> , notes.....	647	absorption by bacteria.....	315
<i>napobrassicæ</i> , notes, Conn.State.....	547	as a water-sterilizing agent.....	474
spp., notes, Conn.State.....	547	affected by bacteria.....	315
<i>Phomopsis citri</i> , notes, U.S.D.A.....	248	availability in basic slag.....	797
studies, Fla.....	247	citric acid soluble, determination in Thomas slag powder.....	409, 410
<i>mali</i> n. sp., notes, U.S.D.A.....	154	determination in beer.....	798
Phonolite, fertilizing value.....	215, 319, 625	foods.....	809
ground, zeolitic properties.....	518	presence of magnesium chlorid.....	609
<i>Phorbia brassicæ</i> , notes, Oreg.....	158	slag.....	795
<i>Phormium tenax</i> fiber, strength of, U.S.D.A....	313	displacement by water in leaves.....	218
<i>Phorocera claripennis</i> , notes, U.S.D.A.....	455	effect on variation of tomatoes and beans, Md.....	339
<i>Phorodon humuli</i> . (See Hop aphid.)		fertilizing value.....	227
Phosphate—		hydrochloric acid insoluble, in soils....	515
Algerian, fertilizing value.....	519, 632	in animal nutrition.....	869
deposits in Decatur County, Tennessee..	822	loss from soils, Fla.....	211
North America.....	128	manufacture.....	418
western United States.....	822		
effect on growth of tubercle bacilli.....	381		

	Page.		Page.
Phosphoric acid—Continued.		Pigs, British breeds.....	571
metabolism in infants.....	166	calcium retention by.....	66
minimum, for plant growth, N. Y. State.....	22	cooking food for.....	371
reverted, determination.....	795	destruction by cotton-seed meal, N.C....	75, 76
Phosphorite as affected by ammonium salts.....	624	embryology of.....	371
fertilizing value.....	318	factors affecting pulse rate.....	66
Phosphorus—		fattening with automatic feeders.....	671
compounds in animal nutrition.....	869	feeding experiments.....	170,
of cotton-seed meal and wheat		367, 371, 468, 470, 572,	
bran, Tex.....	804	668, 671, 769, 773, 873	
organic, hydrolysis by enzymes	166	Ala. College.....	370
determination in foods.....	799	Ariz.....	468
effect on <i>Aspergillus</i> spp.....	825	Cal.....	573
for South Dakota soils, S. Dak.....	728	Can.....	272
in soils, effect on composition of turnips,		Colo.....	872
R. I.....	417	Ill.....	772
Photochemical effects from mercury vapor		Mo.....	670
lamp and sunlight.....	218	fish meal for.....	270
Photomicrography of parasites.....	478	inheritance of mammae in.....	470
<i>Phyllosticta pirina</i> , studies, Va.....	648	maintenance requirements, Ill.....	772
<i>ramicola</i> , treatment.....	552	parathyroid glands of.....	377
<i>violæ</i> , studies.....	753	pastures and forages for.....	471
<i>Phyllotreta</i> spp., notes, Can.....	761	raising, Cal.....	573
<i>Phylloxera vastatrix</i> . (See Grape phylloxera.)		in Texas.....	773
<i>Physalospora latitans</i> , notes and treatment.....	250	rotation of blood plasma and serum in.....	881
Physical-chemical tables, book.....	107, 201	selection and feeding, Cal.....	69
Physiology, human, treatise.....	767	tuberculin tests.....	499
papers on.....	676	treatise.....	872
<i>Phytalus mülthi</i> , life history and remedies.....	858	viability of cysticerci in.....	482
Phytin as a source of phosphoric acid.....	423	Pike County, Ala., soil survey, U.S.D.A.....	16
<i>Phytobacter lycopersicum</i> n. sp., description.....	246	Pimenton, origin and composition, U.S.D.A.....	264
<i>Phytonomus meles</i> , notes.....	359	<i>Pimpa conquisitor</i> , feeding habits.....	261
Phytophthora—		<i>pomorum</i> , notes.....	562
<i>cactorum</i> , notes.....	549	spp., notes, Me.....	256
<i>erythrospica</i> n. sp., description.....	550	Pine blister rust, notes and treatment.....	249
notes.....	549	leaf mold, fertilizing value.....	622
<i>jaberi</i> , notes.....	155, 248, 547	midge, gouty, notes.....	656
<i>infestans</i> . (See Potato late blight.)		rusts, notes, Conn. State.....	547
<i>parasitica</i> n.sp., description.....	548	seed as affected by source, U.S.D.A.....	544
sp., affecting cotton.....	749	collection, U.S.D.A.....	444
relation to Hevea canker.....	352	improvement of quality.....	343
spp., notes.....	445	testing.....	44
<i>springæ</i> , description and treatment.....	249	siskin, destruction of grain aphids by,	
Phytophthora, rearrangement of species.....	550	U.S.D.A.....	452
resting mycelia of.....	646	stands, regenerating.....	240
Phytosterol, detection in animal and vegetable fats, U.S.D.A.....	204	stem canker, notes, Conn. State.....	547
Pickle worm, notes, Md.....	353	Pineal gland, physiological function.....	168
Pickles, bottled, examination.....	361	Pineapple chlorosis, relation to calcareous	
Pig clubs in Alabama.....	792	soils, P. R.....	623
feeding establishment, cooperative, in		Pineapples, culture in Burma.....	736
Germany.....	69	lime-magnesia requirements.....	520
houses and fixtures, plans, Colo.....	873	Pines, Austrian, individual selection experi-	
construction.....	292	ments.....	442
insurance clubs in England and Wales.....	471	longevity and yield as affected by	
Pigeon manure, fertilizing value.....	129	depth of planting.....	842
peas, analyses.....	569	management in Saxony.....	342
Pigment, blue, origin in flowers.....	434	North American, distribution,	
Pigmentation in animals, studies.....	466	U.S.D.A.....	149
Pigments, floral, chemistry of.....	434	red, growth measurements.....	343
formation in plants.....	219	reproduction on polar forest border.....	442
Pigs, animal parasites of, Ohio.....	82	Scotch, as affected by source of seed...	841
bacon type, raising.....	773	individual selection experi-	
banana meal for.....	572	ments.....	441
breeding in Alaska, Alaska.....	771	selection-strip method of cutting.....	240
Sao Paulo.....	683	Siberian, distribution and importance.....	442
		volume and value accretion in.....	747

	Page.
Pines, western yellow, growth in pure and composite stands, U.S.D.A.....	43
planting, U.S.D.A.....	544
white, blister rust of, U.S.D.A.....	554
diseases of.....	851
yellow, habitat extension, U.S.D.A.....	545
reforestation, U.S.D.A.....	544
tests of strength.....	387
Pipe, concrete, construction.....	487
for irrigation water.....	485
Pipes, flow of water in.....	181, 290, 891
theory of loads on in ditches.....	685
<i>Piroplasma caballi</i> , notes.....	83
<i>ovis</i> , occurrence in Dalmatia.....	482
Piroplasmosis, bovine. (<i>See</i> Texas fever.)	
equine, in Canal Zone.....	83, 483
Panama.....	682
in sheep.....	81, 482
solipeds in Transcaucasia..	582
infection through mucous membranes of dogs.....	483
<i>Pisum sativum</i> as affected by light.....	526
Pith-ray flecks in wood, U.S.D.A.....	44
Pituitary body extracts, effect on cows.....	578
Pituitrin, pressor effect on.....	882
Plague eradication in Porto Rico.....	158
transmission by insects.....	756
Plant alkaloids, treatise.....	503
and animal tumors, comparison.....	548
assimilation as affected by sunlight....	26
breeding—	
experiments with cabbage, Va....	638
cotton, N.C.....	31
flax.....	634
oats.....	532
peppers.....	434
stocks, peas, and	
beans.....	433
timothy.....	635
tobacco, Conn.	
State.....	536
wheat.....	532
N.C.....	31
U.S.D.A.....	38
Wash.....	835
heterozygosis in.....	31
in Scandinavia, handbook.....	636
plats, management.....	636
review of literature.....	830
theory of cryptomery.....	434
factors.....	433
cells, chondriosomes in.....	217
permeability.....	627, 628
physical-chemical analysis.....	408
characteristics, relation to seed weight.	522
chemistry, progress in.....	408
diseases—	
in Indo China.....	46
Iowa.....	445
New South Wales.....	46
Southern Nigeria.....	547
Virginia, Va.....	645
Wurttemberg.....	845
notes.....	243, 341, 446, 645
Conn.State.....	547

	Page.
Plant diseases—Continued.	
notes, Oreg.....	150
P.R.....	645
relation to meteorological conditions.....	44
review of literature.....	445
treatise.....	150, 546, 644
(<i>See also different host plants.</i>)	
distribution, relation to evaporation....	826
embryos as affected by endosperm of seeds.....	421
food in soils as affected by fertilizers, Va	623
production as affected by soil sterilization.....	122
growth as affected by—	
acids, bases, and salts.....	26
boron compounds.....	219
different substances.....	421
fertilizer salts.....	329
nitrogenous soil constituents.....	219
shade, U.S.D.A.....	130
smoke.....	422
thorium X.....	131
growth, cause.....	420
power exerted in.....	827
relation to soil temperature....	19
hybrids, factor transmission in.....	433
heredity of form and structure	
in, Miss.....	320
sterility in.....	320
inspection. (<i>See</i> Nursery inspection.)	
lice injurious to orchard and bush	
fruits, Oreg.....	158
notes.....	854
Me.....	251
remedies, N.Y.State.....	356
(<i>See also</i> Apple aphid, etc.)	
morphology, bibliography.....	626
nutrition, studies, N.Y.State.....	22
parasites and hosts, chemical relationship.....	323
notes.....	341
physiology, bibliography.....	626
progress in.....	408
Quarantine Act, notes, U.S.D.A.....	342
succession, rôle of light in.....	218
tissues, growing, respiration in gases, N.Y.Cornell.....	538
Plantains, varieties for Philippines.....	839
in Seychelles.....	839
Plants—	
absorption of nitrogen by.....	732
adsorption of nitrogen by.....	732
animals affecting.....	547
as affected by coal-tar vapors.....	530
colored light.....	526
formaldehyde.....	827
graphite.....	19
high temperatures.....	27
light.....	526
salt solutions.....	218
suppression of endosperm.....	629
tobacco smoke.....	30
assimilation of permuted nitrogen by..	127, 517
carbon assimilation of.....	28
classification, book.....	216

	Page.		Page.
Plants—Continued.		Plowing by steam in Bombay Presidency ...	592
climatic relations	719	effect on soil bacteria	221
collecting, U.S.D.A.	327	moisture, N.Dak	211
composition as affected by sodium salts,		Plows, construction and operation	292
R.I.	419	motor, tests	86, 185
denitrification in	325	use in Uruguay	87
desert, root habits	626	tests	390
distribution of ions in	323	Plum black knot, notes and treatment	155
experimental rooms for	167	curculio, notes	353
factors affecting susceptibility to disease ..	844	fire blight, notes, Wash.	848
flowering, notes	341	<i>Plumbago scandens</i> , notes, Ariz.	441
forcing with radium	131	Plums, adaptation and variety tests, U.S.	
formation of anthocyan pigments in	421	D.A.	41
nitrogen by	133	composition as affected by irriga-	
green, respiratory quotient of	27	tion, Idaho	236
herbaceous, culture in Alaska, Alaska ..	743	cost of production	439
higher, assimilation experiments	732	culture in Alaska, Alaska	743
imports, U.S.D.A.	524	new, descriptions, N.Y.State	838
introduction, Ariz.	440	preservation	312
introductions at Kew botanic garden ..	441	reducing and nonreducing sugars in ..	503
irritability in	421	silver leaf disease affecting	845
living, sterilization	408	varieties, Can	235
manganese in	28	resistant to disease	246
medicinal, improvement	31	Plymouth Rocks, barred, color standard ..	372
nitrogen nutrition in	628	Pneumonia, equine. (<i>See</i> Influenza, equine.)	
of Connecticut Valley, Mass., handbook ..	216	<i>Poa</i> spp., germination experiments	143
ornamental, diseases affecting, Can	242	<i>Podisus maculiventris</i> , notes, U.S.D.A.	456
of New Mexico, N.Mex.	842	<i>Pæcilocoris latus</i> , notes	446
relation to salt spots	422	<i>Pogonomyrmex barbata</i> , notes, Ariz.	453
soils	212	Point Pleasant area, W.Va. soil survey,	
resistant to insect attack	653	U.S.D.A.	17
respiration in gases	525	Poisons, effect on seeds	529
seedling, tin cans <i>v.</i> pots for, Hawaii ..	236	Poles, use in Canada	843
structure terminology	665	Poliomyelitis in sheep	681
symbiosis in	323	relation to stable flies	559, 560
tolerance toward sodium salts	625	Pollen, germination	437
transpiration and water vapor retention		red clover, physiology of	829
in	524	toxin, studies	377
treatise	420	vitality	41, 326
utilization of ammonium salts by	133	Pollination, bibliography	437
variations in	321	<i>Polycaon confertus</i> , notes	657
water requirements, U.S.D.A.	825	<i>Polychrosis botrana</i> , remedies	655
wilting, studies and bibliography	523	<i>Polydrosus impressifrons</i> , notes	252
woody, of German East Africa	643	<i>Polygala butyracea</i> , rot bacteria affecting ..	345
Kentucky, Ky.	41	Polyneuritis, experimental, treatment ..	463
periodicity in	442	gallinarum, relation to food-	
recovery from hail wounds	131	stuffs	865
Plasmodia, photomicrographs of	478	studies	180
<i>Plasmodiophora brassicæ</i> . (<i>See</i> Cabbage club		treatment	568
root.)		<i>Polyplax spinulosus</i> , distribution on rats ..	755
Plasmolysis, false, in eel grass	134	<i>Polyporus berkeleyi</i> , notes	852
in plant cells	627	<i>dryophilus</i> , notes	851
<i>Plasmopara cubensis</i> , notes	243	<i>lignosus</i> , notes	547
<i>viticola</i> , germination of winter		<i>lucidus</i> , notes	446
spores	350	<i>vaporarius</i> , notes	157
incubation period	350	<i>Polystictus hirsutus</i> , treatment	552
studies	155, 249	<i>Polytrichum commune</i> , eradication, Vt.	741
treatment	50	Pomace fly, biological studies	457
Plaster, land. (<i>See</i> Gypsum.)		Pomelos, analyses	362
<i>Platyomus lividigaster</i> , life history, Hawaii ..	253	changes in, during ripening, Fla.	641
<i>Pleospora herbarum</i> , notes	245	sugar and acid content, Fla.	641
Pleuro-pneumonia, contagious, in cattle,		Pomology, teaching	694
ultramicroscopic bodies in	587	Pond mud, fertilizing value	625
(<i>See also</i> Influenza, equine.)		weed, floating, growing for wild ducks ..	373
<i>Ploceoderus ruficornis</i> , notes	457	Ponds, fertilizer experiments	731
<i>Plorabunda oculata</i> , studies, Okla.	355	Ponies, Mountain and Moorland, notes	573
Plowing, animal <i>v.</i> mechanical power for	185	polo, breeding in England	874

	Page.
Ponies, Welsh and Exmoor wild, as foundation stock for army remounts.....	874
(See also Horses.)	
<i>Pontia monuste</i> , notes, P.R.....	652
<i>Poaceetes gramineus</i> , destruction for grain aphids by, U.S.D.A.....	452
Pop corn, culture, U.S.D.A.....	743
varieties, Ariz.....	426
Popence, E. A., biographical sketch.....	699
Poplar wood, production in France.....	43
Poppy, floral anomalies in.....	629
seed oil, detection.....	613
<i>Portia atroporia</i> n. sp., description.....	451
Pork production, notes, Cal.....	69, 573
sausage, preservation.....	312
<i>Porphyrothrips cottei</i> n. g. and n. sp., description.....	854
<i>Porthetria dispar</i> . (See Gipsy moth.)	
Porto Rico College, notes.....	900
Station, report.....	696
Sugar Station, report.....	95
Postal saving banks in various countries.....	895
Pot experiments, factors affecting yield.....	514
<i>Potamogeton natans</i> , growing for wild ducks..	373
Potash—	
absorption by bacteria.....	315
from zeolites.....	625
as a top dressing for pastures.....	632
availability in feldspathic fertilizers.....	796
deposits in California.....	319
Germany.....	319
Great Basin.....	518
Kalusz, eastern Galicia.....	822
determination.....	796
in fertilizers.....	308
displacement by water in leaves.....	218
effect on—	
apples, Pa.....	438
variation of tomatoes and beans, Md.....	339
fertilizers, comparison.....	126, 215, 516
effect on conservation of pears.....	640
fertilizing value.....	227
from feldspar.....	518
freshly cut kelp.....	519
seaweed.....	128
silicates.....	215, 518, 822
loss from soils, Fla.....	211
minerals, fertilizing value.....	625
minimum, for plant growth, N. Y. State.....	22
salts, effect on disease susceptibility in	
cereals.....	844
germination of seeds... ..	328
production and use in 1911.....	213
in Germany in 1912.....	128
substitution for common salt in nephritis.....	167
(See also Potassium salts.)	
solubility as affected by bacteria.....	315
sources of in United States, U.S.D.A.....	419
Potassium—	
carbonate, effect on germination of seeds.....	328
fertilizing value.....	632
chlorid, effect on activity of malt diastase.....	528
composition of turnips,	
R.I.....	418
germination of seeds....	327

	Page.
Potassium—Continued.	
chlorid, fertilizing value.....	625, 830
determination.....	307, 609
in fertilizers.....	409
foods.....	809
effect on <i>Aspergillus fumigatus</i>	30
growth of tubercle bacilli.....	381
excretion under normal and pathological conditions.....	166
nitrate, effect on flow of rubber latex....	748
germination of seeds....	328
legume bacteria.....	733
salt as an adulterant of table salt.....	867
salts, effect on composition of plants, R.I.....	419
extraction from silicate rocks.....	215
in salines of United States, U.S.D.A.....	214
(See also Potash salts.)	
separation from sodium.....	807
Potato—	
beetle, Colorado, notes, Can.....	252
Mont.....	652
chips, preparation.....	414
corky or powdery scab, notes.....	448
diseases, investigations.....	549
notes.....	444, 646
Me.....	141
N.J.....	549
treatment, Can.....	242
Md.....	336
Mich.....	146
dry rot, investigations.....	47
Nebr.....	47
drying industry in Germany.....	209
progress in.....	509
flakes, analyses.....	470
preparation.....	414
flea beetle, notes, Can.....	761
studies and bibliography, Me.....	258
late blight affecting tomatoes.....	246
description and treatment,	
N.Y. Cornell.....	549
infection experiments.....	153
investigations, Vt.....	550
notes.....	445
oospores of.....	846
treatment.....	549
Fla.....	242
leaf roll, notes.....	150, 550
studies.....	40, 246, 347
powdery scab, notes.....	448
occurrence in Maine.....	550
treatment.....	549
refuse, nutritive value.....	665
root rot, notes.....	445
rot, investigations.....	550
scab, treatment.....	646
silver scurf, studies and bibliography,	
U.S.D.A.....	347
skins, impermeability.....	628
isolation of fat from.....	459
sprayers, tests.....	292
tops, nutritive value.....	665
tuber diseases, descriptions and treatment, U.S.D.A.....	549
moth, notes, U.S.D.A.....	855
remedies.....	855

	Page.		Page.
Potato—Continued.		Potatoes—Continued.	
tubers, morphology and histology.....	628	variety tests, difficulties in.....	41
wart disease, studies.....	448, 449	water requirements, U.S.D.A.....	826
Potatoes—		wild, selection and improvement.....	535
abnormal root formation in.....	217	yield as affected by hilling.....	431
accumulation of sugar in.....	219	source of seed, Vt.....	739
as affected by storage, Md.....	230	yields.....	228
sulphuric acid in irrigation		<i>Potentilla fruticosa</i> , notes, Vt.....	741
water, U.S.D.A.....	330	Poudrette, fertilizing value.....	129
ash analyses, Ohio.....	861	Poultry—	
composition as affected by sodium salts,		breeding for egg production.....	874
R.I.....	420	review of literature.....	276
cost of distribution.....	492	building at Cornell University.....	70
culture.....	395, 535, 830	caponizing.....	168
Md.....	336	care and management, Md.....	371
N.J.....	535	cooling rack, metal, description, U.S.D.A.....	87
U.S.D.A.....	194	diseases, notes and treatment, U.S.D.A.....	385
experiments.....	138, 331, 427	treatment, Ga.....	574
Ariz.....	426	dressed, handling and marketing, U.S.	
N.Dak.....	226	D.A.....	472
U.S.D.A.....	137, 330	dressing and marketing.....	472
in Alaska, Alaska.....	735	experiments.....	574
West Virginia, W.Va.....	744	Can.....	273
effect on nitrate content of soils, N.Y.		fattening crates, construction.....	472
Cornell.....	818	feeding and management.....	70
feeding for cheese production.....	475	feeding experiments.....	275, 472
fertilizer experiments.....	23, 125, 213,	Can.....	672
227, 228, 318, 427, 635, 821		feeds, analyses.....	467
Alaska.....	727	N.H.....	769
Me.....	129	R.I.....	570
U.S.D.A.....	330	hatching and rearing by artificial means..	373
food value.....	463	houses, construction.....	293
green manuring, U.S.D.A.....	330	plans and specifications.....	689
growth as affected by sulphur.....	215	housing experiments.....	471
in shade, U.S.D.A.....	130	improving quality of, U.S.D.A.....	472
insects affecting, Me.....	259	industry in Germany.....	574
irrigation, Nebr.....	736	United States, U.S.D.A.....	774
experiments.....	182, 426	keeping, lecture on, Me.....	774
N.Dak.....	226, 425	live, cost of distribution.....	492
Nev.....	138	management.....	574
U.S.D.A.....	32	manure, treatment and use, Mass.....	820
liming experiments, Can.....	223	market, production.....	574
marketing cooperatively.....	392	marketing.....	574
notes.....	338	modern breeds.....	471
respiration and decay.....	565	notes, Ga.....	573
seed, cold storage v. cellar storage, Md..	336	raising in Porto Rico, P.R.....	666
improvement, U.S.D.A.....	230	notes, U.S.D.A.....	171
local v. imported, U.S.D.A.....	331	sex nature of.....	466
production and handling, Me.....	141	treatise.....	69, 193, 371, 573
selection, S.Dak.....	37	work at Oregon Station.....	70
seeding experiments, Can.....	224	(See also Chickens, Ducks, etc.)	
N.Dak.....	226, 425	Power for the farm, pamphlet.....	688
spraying, U.S.D.A.....	194	Prairie dogs, control, Mont.....	651
experiments.....	845	hay, analyses, Can.....	270
storage, U.S.D.A.....	696	Precipitation—	
experiments, N.Dak.....	425	and run-off, Ishikari River, Japan.....	813
treatment with corrosive sublimate, Can..	242	relation to stream flow, U.S.D.A.....	121, 812
varieties.....	228, 427, 530, 635, 830	(See also Rainfall, Snowfall, etc.)	
Alaska.....	735	Precipitins, production.....	581
Ariz.....	426	Pregnancy, diagnosis.....	377, 408, 476, 477, 778
Can.....	222	Primula, culture in Alaska, Alaska.....	743
Md.....	336	<i>Pristomerus hawaiiensis</i> , notes, Hawaii.....	253
Mont.....	630	Privet leaves, formation of fats in.....	201
N.Dak.....	225, 226, 425	Privy, sanitary, construction and care.....	88
Nebr.....	736	<i>Prodenia litleralis</i> , notes.....	456
Nev.....	138	<i>Profenusa collaris</i> , notes.....	252
resistant to wart disease.....	448	Prony brake, description and use.....	488

	Page.		Page.
Propionamid as a source of ammonia, Iowa..	723	<i>Psychoda albiaculata</i> n. sp., description	159
Proso, culture experiments, N. Dak.	424	<i>Psychonotus</i> sp., notes, P. R.	652
in Texas Panhandle, U. S. D. A.	429	<i>Psylla isitis</i> , life history and remedies	854
<i>Prosopitella berlesii</i> , notes	854	<i>pyri</i> (<i>pyricola</i>). (See Pear psylla.)	
<i>perniciosa</i> n. sp., description	459	<i>Psylliodes punctulata</i> . (See Hop flea beetle.)	
parasitic on San José		<i>Pterocarpus marsupium</i> , notes	443
scale	758	<i>Pteromalus egregius</i> , notes, Me.	252
<i>peruviana</i> n. sp., description	359	<i>Pteroptrichoides perkinsi</i> n. sp., notes, Hawaii.	253
Proteid. (See Protein.)		Public health, relation to well and spring	
Protein—		water	512
assimilation, review of investigations....	567	<i>Puccinia</i> —	
catabolism as affected by glucose	663	<i>coronata</i> , winter resistance of uredospores ..	645
studies	164	<i>dispersa</i> , wintering over in uredo stage ..	346
cleavage products, fatigue producing,		<i>geranii</i> , studies	345
studies	568	<i>maydis</i> , studies	45
formation, localization in plants	323	<i>psidii</i> , notes	243
metabolism, relation to thyroid secretion.	868	spp., notes	445
utilization of ammonia in ..	62, 365	Puget Sound Basin, Wash., soil survey, U. S.	
Proteins—		D. A.	17
agglutination	502	Pulleys, power-transmitting capacity	458
chemistry of, treatise	408	Pulp and paper industry, bibliography, U. S.	
coagulation by heat	501, 502	D. A.	119
ultraviolet rays	130, 131	wood, production in Canada	344
constitution	715	Pulse irregularities in horses	671
density and solution volume	108	<i>Pulvinaria vitis</i> (= <i>innumerabilis</i>). (See	
detection	715	Maple-scale, cottony.)	
maintenance experiments with	767	Pumping plant for drainage	785
of corn, nutritive value	62	plants for irrigation in Kansas	784
gliadin, modifications in	608	use in irrigation, U. S. D. A.	121, 181
rice, reagent for	881	Pumpkins, parthenogenesis in	837
tyrosin content	465	transformation of nitrogen by	133
utilization as affected by fasting	268	Pumps, centrifugal, notes	893
Protoplasmic contractions resembling plas-		motor-driven, design and operation ..	489
malysis in eel grass	134	reciprocating, notes	292
Protozoa, determination in soils	123	two-stage turbine, tests	893
from sewage-sick soils, notes	316	Purdue University, notes	698
infectious, notes	676	Purin bases of muscles, behavior during fa-	
relation to bacterial activity in		tigue	366
soils	123	bodies, studies	63
treatise	360	metabolism, studies	63, 365
Prune industry in Oregon, Oreg.	148	Purslane sawflies, notes	252
orchards, protection against frost, Oreg.	147	Pus cells. (See Leucocytes.)	
Prunes, ash analyses, Ohio	861	<i>Pycnoderes quadrimaculatus</i> , notes, Ariz.	453
composition as affected by irrigation,		<i>Pycnosoma megacephala</i> , notes	482
Idaho	236	Pyemia in horses	179
dried, preparation and use, U. S. D. A.	462	Pyocyanase, properties of	378
drying, Oreg.	148	<i>Pyrausta vastatrix</i> , notes	453
Pruning, effect on sweet peas and tomatoes,		Pyridin bases, detection in ethyl alcohol	312
Md.	339	Pyrites, production and use in 1911	213
<i>Prunus laurocerasus</i> , hydrocyanic acid in ..	133	Pyritic cinder, fertilizing value	129
Prussic acid. (See Hydrocyanic acid.)		Pyrophosphate, assimilation by plants	624
<i>Psalliotia campestris</i> , prevalence in South		Pyrophosphoric acid, relation to toxicity of	
Africa	461	cotton-seed meal, N. C.	76
<i>Pseudococcus bakeri</i> , notes	454	<i>Pyrus sinensis</i> , studies, N. Y. Cornell	541
<i>calceolariz</i> , notes, U. S. D. A.	53	<i>Pythiacystis citricola</i> , notes	243
<i>citri</i> . (See Citrus mealy bug.)		<i>Pythium debaryanum</i> , notes	549, 647
<i>nicotianæ</i> n. sp., description	758	sp., affecting cotton	749
<i>sacchari</i> , notes	854	Quack grass, identification	741
P. R.	52	Quince fire blight, notes, N. Y. Cornell	348
<i>yerba-santæ</i> n. sp., notes	455	Wash	848
<i>Pseudomonas campestris</i> , notes, Conn. State ..	547	fruit spot, notes, Conn. State	547
<i>cerasus</i> , notes, Oreg.	154	juice, fermentation	116
<i>fluorescens</i> , notes, Vt.	157	Quinoes, fibro-vascular system	542
<i>gladioli</i> n. sp., studies	845	reducing and nonreducing sugars in ..	503
<i>Pseudophoenix sargentii</i> , notes	341	Quincy Valley, Wash., irrigation project	486
<i>Psoroptes communis ovis</i> , notes	159	Quinin, use against rabies in dogs	883

	Page.		Page.
Rabbit skin clippings, fertilizing value.....	129	Rations, balanced, notes.....	362
Rabbits, agouti-black color in.....	466	combining for live stock.....	170
castration.....	168	for cows, Md.....	375
epidemic disease in.....	677	Minn.....	575
immunity against anthrax bacillus.....	378	mineral content of, effect on growth.....	64
immunization against bovine tuber- culosis.....	480	Rats as a menace to health.....	852
relation to tapeworms in pigs.....	482	bionomics of.....	756
typhoidlike disease in.....	288	destruction in ships.....	651
<i>Rabdophaga saliciperda</i> , notes and remedies..	558	habits of.....	651
Rabies, Negri bodies in.....	379	leprosy in.....	651, 756
treatise.....	679	parasites of.....	755
treatment.....	679, 883	white, immunity against anthrax bacil- lus.....	378
Radio-activity, effect on germination of seeds.	326	Recurrent fever, etiology.....	479
Radish maggot, notes, Oreg.....	158	<i>Recurvaria piceaella</i> , notes, Me.....	256
Radishes, enemies of.....	556	Red Bluff area, Cal., soil survey, U.S.D.A....	17
growth in shade, U.S.D.A.....	130	clover. (See Clover, red.)	
Radium, forcing plants with.....	131	dog flour. (See Flour, red dog.)	
Railroad rates, relation to cost of living.....	594	headed fungus, notes.....	852
ties, preservation.....	240	scale, notes.....	654
U.S.D.A.....	344	spider. (See Spider, red.)	
use in Canada.....	843	Redtop—	
Rain as a drinking water supply in British Guiana.....	16	analyses, Can.....	270
fertilizing value, Can.....	209	culture experiments.....	631
spotting of morning-glories by.....	752	in the Ozarks, Mo.....	427
water, penetration of soil surfaces by, Ariz.....	426	seed, adulteration and misbranding, U.S. D.A.....	144
hardness of.....	122	germination and purity tests, Vt....	741
Rainfall, approximating over long periods...	14	seeding experiments on ranges, U.S.D.A.	531
as affected by forests.....	842	Redwater. (See Texas fever.)	
at Arecibo, P.R.....	85	Rhodesian. (See African coast fe- ver.)	
North Platte, Nebr.....	225	Redwood, long-seasoned, strength tests.....	442
deficient, in summer of 1913.....	813	volume table.....	442
effect on composition of wheat, Wash.....	834	Reforestation as affected by birds and ro- dents, U.S.D.A.....	545
heavy, at Montell, Texas, U.S.D.A.....	721	Refrigeration, effect on hops, U.S.D.A.....	13
in Alberta and Saskatche- wan.....	85	Refrigerators, use.....	88
Arkansas, U.S.D.A.....	510	Reindeer industry in Russia.....	772
Berkeley, California, U.S. D.A.....	510, 511	<i>Remigia repanda</i> , notes.....	356
in Sulphur Spring Valley, Ariz.....	725	Rennet, determination of activity.....	504
Tennessee, Tenn.....	616	Rennin, effect on casein, N.Y.State.....	805
Victoria.....	896	<i>Reseda odorata</i> , heredity of self-sterility in...	136
(See also Precipitation.)		Resin, clarification.....	719
Raisin industry in Valencia.....	439	Respiration—	
seeds, waste, utilization, U.S.D.A....	13	anaerobic, in fruits and plant tissues, N.Y.Cornell.....	538
Raisins, dried, preparation and use, U.S.D.A.	462	seed plants.....	525
Range conditions in western United States..	666	apparatus for small animals.....	569, 869
Ranges, improvement, Hawaii.....	224	in fruits.....	135
Rape, cooperative experiments.....	138	man, apparatus for recording move- ments in.....	665
culture in Porto Rico, P.R.....	631	plants, studies.....	324
fertilizer experiments, N.Y.State.....	22	Restaurants, inspection, N.Dak.....	661
germination as affected by fertilizers..	327	in Virginia.....	766
growth as affected by fertilizer salts...	329	<i>Rhagidia</i> sp., notes.....	458
oil, detection.....	613	<i>Rhagoletis pomonella</i> . (See Apple maggot.)	
serpentine leaf miner affecting, U.S. D.A.....	857	spp., investigations, N.Y.Cornell..	55
water requirements, U.S.D.A.....	826	<i>Rhigopsidius tucumanus</i> , notes.....	761
Raphanus-Brassica hybrids, studies, Miss...	320	<i>Rhina barbirostris</i> , affecting coconut palms...	858
Raspberries, frost injuries.....	547	<i>nigra</i> , notes.....	853
new, descriptions, N.Y.State.....	838	<i>Rhipicephalus appendiculatus</i> , notes.....	58
Raspberry horn-tail, investigations.....	260	<i>bursa</i> , notes.....	482
rusts, notes and treatment, N.C....	50	<i>stimus</i> , relation to anaplasmosis.....	584
Rat fleas in Suffolk and North Essex.....	55	Rhizobia, determination in soils.....	424
notes.....	755	<i>Rhizobium radicola</i> , action of products elabo- rated by.....	222

	Page.		Page.
<i>Rhizoctonia</i> sp., notes.....	549, 647, 650	Road administration in Wyoming.....	84
Conn.State.....	547	bonds, court decisions concerning.....	183
spp., notes.....	445	materials in Florida.....	387
violacea, notes.....	50, 243, 550	oil, tests.....	687
<i>Rhizoglyphus echinopus</i> as an orchid pest.....	659	pavements, test.....	182
<i>Rhizopogon luteolus</i> , prevalence in South Africa.....	461	river bank experimental.....	85
Rhode Island College, notes.....	399	systems of foreign countries and of the several States.....	890
Station, notes.....	399, 700	Roads Arbor Day.....	695
Rhodes grass, culture in Porto Rico, P.R.....	631	construction.....	86
notes, U.S.D.A.....	428	construction and maintenance—	
Rhodesian redwater. (See African coast fever.)		in Nebraska.....	289
<i>Rhogas canadensis</i> , notes, Me.....	256	North Carolina.....	687
<i>Rhopalosiphum betæ</i> n. sp., notes.....	454	papers on.....	291
Rhubarb curculio, biology.....	56	construction in Florida.....	387
<i>Rhynchophorus ferrugineus</i> , notes.....	653	cost of construction.....	387, 890
palmarum, affecting coconut palms.....	858	design and construction.....	182
Rice as a foodstuff.....	865	in California.....	386
ash analyses, Ohio.....	861	Victoria.....	896
Asiatic, analyses.....	865	macadamized, tar spraying.....	687
bran, nicotinic acid in.....	263	maintenance and repair, U.S.D.A.....	388
classification.....	535	preservation experiments, U.S.D.A.....	590
coating, effect on neuritis production.....	865	specifications.....	487
composition as affected by fertilizers, Hawaii.....	231	superelevation at bends.....	487
culture experiments.....	830	yearbook.....	388
Hawaii.....	224	Roaring, etiology.....	500
in Kongo.....	336	in horses, treatment.....	83
Madagascar.....	635	Roborin, feeding value.....	467
disease, notes.....	548	Rock asphalts of Oklahoma.....	591
"false" smut, notes.....	445	phosphate. (See Phosphate.)	
feed meal, methods of analysis.....	311	Rockcastle County, Ky., soil survey, U.S.D.A.....	16
feeds, analyses.....	467	Rocks, weathering.....	123
fermented, liquor from.....	118	Rodents, destructive, notes, Ohio.....	793
fertilizer experiments.....	228, 830	effect on reforestation, U.S.D.A.....	545
flour, medicinal value.....	865	Roentgen rays, effect on cigarette beetle.....	359
germination energy of.....	538	use against tumors.....	476
tests.....	740	<i>Rastelia aurantiaca</i> , notes, Conn.State.....	547
ground puffed, analyses, N.J.....	666	Rollers, cement, construction, Mont.....	688
hulls, determination in feeding stuffs.....	810	Root borers in West Indian soils.....	858
meal, analyses.....	367	crop diseases, notes, Can.....	242
polish, ash analyses, Ohio.....	861	crops, accuracy of dry-matter determinations.....	310
polished, composition.....	565	as affected by soils.....	577
polishings, vitamin-fraction from.....	664	cooking.....	566
pollination and cross-fertilization in.....	522	culture experiments.....	431
proteins, reagent for.....	881	in Brazil.....	428
relation to beriberi.....	269, 460	for cows.....	577
root rot, studies.....	447	profitableness of production.....	89
seeding experiments.....	830	seeding experiments.....	432
smut, notes.....	245	varieties.....	427
sulphur and chlorin content, Hawaii.....	231	development as affected by fertilizer salts.....	328
ufa disease, notes.....	445	geotropism, relation to starch.....	322
use in various countries.....	865	hairs, callose in.....	326
varieties.....	228, 830	maggots, notes, Can.....	252
in Yamethin district, Burma.....	736	U.S.D.A.....	454
water weevil, habits and remedies.....	259	Roots, adsorption of nitrogen by.....	732
weevil, notes.....	458	cooking.....	566
Ricinus diseases, notes.....	243	for lambs, Can.....	271
Rickets, relation to diet.....	464	Rope, manila, manufacture.....	86
Rinderpest, control in island of Panay.....	582	Ropes, knotting and splicing.....	390
River bank experimental road.....	85	<i>Rosa rugosa</i> , culture in Alaska, Alaska.....	743
discharge, handbook.....	487	Rosaceae, after-ripening of.....	134
measurements under ice conditions.....	813	Rose black spot, description and treatment, Ala. College.....	552
Rivers in California, notes, U.S.D.A.....	415, 510, 812	crown gall, notes, Conn. State.....	547
		geranium, culture in Algeria.....	149

	Page.		Page.
Rose scale, notes, Me.....	251	Rural survey in southern Minnesota.....	489
slug caterpillar, notes, U.S.D.A.....	855	welfare, treatise.....	190
Roselle, description and analyses.....	161	Rust fungi, wintering over in uredo stage....	346
notes.....	566	Rusts, unattached aecial forms in North	
Roses, culture experiments, Can.....	235	America.....	749
fertilizer experiments.....	840	(See also Corn, Wheat, etc.)	
isolation of fat from.....	459	Ruta-bagas. (See Swedes.)	
red, development.....	642	Rutgers College, notes.....	98
Rotation experiments.....	227, 632	Rye, analyses, Wis.....	367
Can.....	222	bran, analyses.....	367
Ohio.....	36, 137, 728	N.J.....	666
S.Dak.....	728	bread, digestibility.....	565
U.S.D.A.....	31	cost of production, N.Dak.....	690
of crops.....	830	culture experiments.....	632
Nebr.....	736	Alaska.....	735
in the South.....	330	in Texas Panhandle, U.S.D.A.....	429
new basis for.....	516	distillers' grains, digestibility, Md.....	367
treatise.....	139	effect on milling quality of wheat,	
Rothamsted Experiment Station, review of		N.Dak.....	866
work.....	226	feeds, analyses, Wis.....	367
Rubber—		fertilizer experiments.....	126, 331, 631, 632, 821
analyses, Hawaii.....	241	for summer silage.....	473
canker, notes and treatment.....	351	Fusarium disease, notes.....	447
Castilla, culture experiments, P.R.....	642	germination as affected by fertilizers...	327
in Dominica.....	748	germinative ability and vegetative force	740
Ceara, tapping experiments, Hawaii.....	241	germs, analyses and feeding value.....	467
culture experiments, Hawaii.....	747	grass, culture experiments.....	631
in British Guiana.....	644	Italian, seeding experiments on	
Trinidad and Tobago.....	644	ranges, U.S.D.A.....	531
treatise.....	644	seed, germination energy of.....	538
depolymerisation and conversion.....	149	ground, analyses, N.J.....	666
determination.....	408	growth as affected by fertilizer salts...	329
diseases, notes.....	749	meteorology.....	510
fertilizer experiments.....	843	on volcanic ash, Alaska.....	726
Hawaii.....	748	irrigation experiments.....	182, 631, 632
from osage orange.....	546	liming experiments, Can.....	223
Hevea. (See Rubber, Para.)		middlings, analyses, N.J.....	666
leaf disease, notes.....	250	nematodes affecting.....	151
Para, bacterial disease affecting.....	51	pollen, toxicity.....	377
natural coagulation in latex.....	149	products, analyses.....	467
tapping experiments.....	240	seed, tests and treatment.....	446
plantations, starting, Hawaii.....	747	seeding experiments.....	426
root diseases, notes.....	547	varieties, Can.....	222
spotting, studies.....	451	U.S.D.A.....	428
tapping, Hawaii.....	748	water requirements, U.S.D.A.....	826
experiments.....	240, 644, 843	yields, N.Dak.....	425
trees, anatomical studies.....	842	Nev.....	138
wild lettuce, composition.....	241	Sacbrood notes, U.S.D.A.....	57
Ruminants, direct transfer of food and drink of	66	<i>Saccharomyces apiculatus</i> , notes.....	116
Rural banking system in Virginia.....	91	cerevisiz, symbiosis by.....	714
conditions, betterment.....	691	Saccharose—	
credit. (See Agricultural credit.)		detection.....	808
depopulation, correcting.....	896	determination in condensed milk.....	810
in Minnesota.....	490	foods and condiments..	715
notes.....	101	resorption in small intestine.....	268
economics, manual.....	894	<i>Sagaritis websteri</i> n. sp., description.....	563
research work in.....	694	Sain, notes.....	443
woman's place in.....	898	Sainfoin, sclerotia disease affecting.....	845
economy as a factor in success of the		seed, germination energy of.....	538
church.....	594	Saj, notes.....	443
Education Conference, report.....	296, 297	Saké, utilization of rice proteins by.....	565
homes, sewage disposal for, U.S.D.A.....	194	Sal forests as affected by drought.....	443
indebtedness in United States.....	491	Salep, analyses.....	463
life conference in Vermont.....	197	Salicin, decomposition by emulsin.....	505
problems, notes.....	894	hydrolysis by enzymes.....	506
reconstruction in Ireland.....	894	Saline deposits in Great Basin.....	518
schools. (See Schools, rural.)		Saliva, human, as affected by diet.....	164

	Page.		Page.
Saliva, human, effect of nutrition on amylase content.....	568	Sawflies, new, in U. S. National Museum.....	563
Salt, adulteration.....	867	<i>Saxifraga peltata</i> as a host of grape root worm..	657
content of leaves, induced variations in..	134	Scabies. (See Sheep scab.)	
nonhalophytes, variations in.....	28	Scale insects, destruction by <i>Chilocorus similis</i>	258
effect on activity of malt diastase.....	528	injurious to citrus fruits.....	654
germination of seeds.....	327	of South Carolina, notes.....	53
proteolytic enzymes.....	268	remedies, Fla.....	262
marsh grass, analyses, Can.....	270	table for separation, Me.....	251
marshes of Porto Rico, P.R.....	513	oyster-shell. (See Oyster-shell scale.)	
solutions, effect on—		red, notes.....	654
germination of seeds.....	218	San José. (See San José scale.)	
plants.....	218	scurfy, notes, Me.....	251
soil temperature, Mich.....	620	soft, parasites of.....	654
spots, relation to plants.....	422	white, notes.....	654
value in the diet.....	664	<i>Scapteriscus didactylus</i> , notes, P. R.....	52
Salton sea water, studies, Ariz.....	415	parasites of.....	653
Salt peter, Chile. (See Nitrate of soda.)		studies, Ga.....	557
effect on flow of rubber latex.....	748	<i>Scaptomyza flaveola</i> , parasite of.....	359
Salts, acid, effect on <i>Aspergillus niger</i>	734	<i>Scelio</i> n. spp., descriptions.....	562
effect on concrete.....	686, 891	<i>Schistocerca parenensis</i> , parasite of.....	354
plant growth.....	329	<i>Schistodepressaria nervosa</i> , notes.....	759
root development.....	328	<i>Schizoneura lanigera</i> . (See Apple aphid,	
seeds and seedlings.....	421	woolly.)	
mineral, rôle in metabolism of infants..	366	<i>ulmi</i> (<i>fodiens</i>), notes.....	654
toxicity toward plants as affected by		<i>Schizosaccharomyces pombe</i> , symbiosis by.....	714
calcium.....	322	School children, examination.....	297
Salvarsan, use against anthrax.....	679	feeding.....	464, 465
equine influenza.....	385	treatise and bibli-	
rabies.....	679	ography.....	162
surra.....	176	malnutrition in.....	465
<i>Salvinia natans</i> , reactions of root hairs.....	828	of Antwerp, nutrition coeffi-	
San José scale, notes.....	353	cient.....	364
Md.....	353	districts, consolidation.....	597
Me.....	251	fairs, county, in Virginia.....	599
Oreg.....	158	Garden Association of America.....	296
Tenn.....	53	gardening, bibliography.....	296
parasites of.....	758	in Germany.....	598
Sand and gravel deposits in Virginia coastal		gardens, discussion.....	399
plain.....	513	guide.....	598
areas, reclamation.....	427	in Cleveland.....	898
cement, investigations.....	183	Denmark.....	495
effect on nitrification in clay soils, Va..	622	Memphis, Tennessee.....	494
flies, habits.....	856	model, at Paris exposition..	494
relation to pellagra.....	357	preparation and management	495
verruca.....	856	text-book.....	792
hills, forestation, U.S.D.A.....	43	grounds, improving.....	598
Sándan, notes.....	443	lunches, notes and bibliography.....	267
Sanitation, chlorid of lime in.....	512	preparation and serving... 464, 465	
Sap ascent, studies.....	422, 524, 828	sanitation, paper on.....	465
extraction from plant organs.....	828	Schools—	
<i>Saperda tridentata</i> . (See Elm-borer.)		agricultural. (See Agricultural schools.)	
Sapotacea, description.....	60	correlation with home needs.....	362
Sapromyzida, synopsis.....	358	diet and hygiene in, treatise.....	363
<i>Sarcocystis tenella</i> in sheep, studies.....	81	elementary, agriculture in.....	91, 99, 394
Sarcoma in fowls, variations in.....	385	manual training in.....	297
<i>Sarcophaga caridei</i> , notes.....	354	nature study in.....	394
<i>fulcata</i> , studies.....	760	entomological collection for.....	395
Sarcosporidiosis in sheep, studies.....	81	farm crop exhibit for, Minn.....	93
<i>Sargatitis</i> sp., notes, U.S.D.A.....	855	high, agricultural course for.....	91
<i>Sasa paniculata</i> , carbohydrates of.....	803	extension in.....	298
Sausage, analyses.....	59, 863	agriculture in.....	597, 897
detection of added water in.....	460	U.S.D.A.....	494
methods of analysis.....	863	gardening course for.....	193
pork, preservation.....	312	home economics course for.....	792
Sawdust, analyses.....	467	state aid for, in Nebraska.....	99
digestibility.....	65, 467	housekeeping, in Norway.....	597
		of Hamilton County, Indiana.....	394

Schools—Continued.	Page.	Seeds—Continued.	Page.
of Winnebago County, Illinois.....	91	determination of germination energy of..	538
rural, agricultural course for.....	192	effect of size on yield.....	632
extension work in.....	899	ensiled, germination, Vt.....	741
agriculture in.....	92, 695	examination.....	740
as social centers.....	91, 465	formation as affected by light.....	526
defects.....	91	germinating, pentosan content.....	525
handbook.....	494	germination—	
hot lunches in.....	465	and purity tests, N.H.....	741
improvement.....	91	Vt.....	741
secondary, agriculture in.....	99, 399	germination as affected by—	
window gardening for.....	898	acids.....	26
<i>Scirpus americanus</i> , analyses, Can.....	270	different substances.....	421
<i>Sclerostomum bidentatum</i> , life history.....	783	electrolyte solutions.....	218
<i>Sclerotinia</i> —		fertilizers.....	327
<i>cinerea</i> and <i>S. fructigena</i> , relationship.....	848	hot water and mechanical treatment,	
<i>fructigena</i> , studies.....	848	Vt.....	740
<i>libertiana</i> , description.....	450	hydrogen peroxid.....	844
and treatment, Fla.....	846	light.....	525, 526, 836
notes.....	243, 650, 751, 753	metallic compounds.....	528
n. sp., description.....	548	radio-activity.....	326
spp. notes.....	243, 549, 646	sulphuric acid.....	628
<i>trifoliorum</i> , notes.....	150, 446, 447, 845	thorium X.....	131
<i>Sclerotium rolfii</i> , notes.....	243	germination—	
<i>Scoletotrichum caricæ</i> , notes.....	243	in salt solutions.....	218
Scolytidæ, identification.....	859	investigations.....	828
<i>Scolytus quadrispinosus</i> , remedies.....	457	tests.....	143
<i>rugulosus</i> . (See Shot-hole borer.)		suggestions for.....	740
Score card for milk stores, U.S.D.A.....	776	germinative ability and vegetative force.....	740
uniform, for fruits.....	40	imports, U.S.D.A.....	424
cards as a factor in judging dairy cows.....	577	inspection, Me.....	144
for food inspection, N.Dak.....	661	N.Y.State.....	40
Screenings, analyses.....	467	in Denmark.....	433
Ky.....	271	North Carolina.....	144
Wis.....	367	Washington.....	266
and digestibility, Md.....	366	leguminous, ash analyses, Ohio.....	861
feeding value, N.Dak.....	866	relation of number of ovules to.....	829
Screw worm, notes, U.S.D.A.....	454	respiration coefficient of.....	525
Scurfy scale, notes, Me.....	251	ripening, reversibility of physiological	
<i>Scutellista cyanea</i> , notes.....	359	processes in.....	526
<i>Scymnus notescens</i> , life history, Hawaii.....	253	sterilization.....	243, 844
spp., notes, U.S.D.A.....	261	testing, precipitin reaction.....	144
studies, Okla.....	355	vitality, detection.....	836
Sea water, effect on concrete.....	686	in grain screenings, Md.....	366
Seaweed, biochemistry of.....	566	weed, analyses and digestibility, Md.....	366
burning in Norway.....	517	germination after passing through	
potash from.....	128	digestive tract, Md.....	367
<i>Secchium edule</i> , notes.....	461	germinative ability.....	836
Seed analyses, interpretation and use.....	143	Seepage losses from irrigation systems.....	181, 289
collection, notes, Can.....	242	<i>Senecio vulgaris</i> , heredity of characters in.....	216
control in Switzerland.....	337	Separators. (See Cream separators.)	
drill, tests.....	893	Sepsis, treatment.....	175
houses, fumigation, Ky.....	641	Septicemia, bacillary, in <i>Arctia caja</i>	855
law in Maryland, Md.....	337	hemorrhagic, immunization.....	179
New Hampshire, N.H.....	741	in sheep.....	179
New York, N. Y. State.....	40	<i>Septobasidium albidum</i> , notes.....	752
laws, notes.....	633	<i>pedicellatum</i> , notes, N.C.....	49
selection, new basis for.....	516	<i>Septobasidium</i> , conidia-bearing species.....	752
weight, relation to plant characteristics.....	522	<i>Septoglæum arachidis</i> , notes.....	347
Seeds—		<i>Septoria graminis</i> , notes.....	845
after-ripening studies.....	527	<i>lycopersici</i> , notes.....	246
analyses.....	144	treatment, Ind.....	435
as affected by poisons.....	529	<i>petroselinii apii</i> , studies.....	846
asepticizing.....	433	<i>pisi</i> , relation to pea blight.....	447
bibliography.....	626	spp., notes.....	49
chemical treatment.....	326	<i>Serica</i> n.sp., notes.....	858

	Page.		Page.
Sericulture. (<i>See</i> Silk.)		Sheep industry in Australia.....	570
Serpentine leaf miner, studies and bibliog- raphy, U.S.D.A.....	857	Hungary.....	670
Serradella —		Russia.....	570
germination as affected by fertilizers	327	Spain.....	370
growth as affected by fertilizer salts	329	inheritance of wool color in, N.H.....	771
Serum and vaccine therapy, notes.....	377	injury due to grazing, U.S.D.A.....	543
ferment, preparation and use.....	280	Kentish, as affected by Cheviot blood.....	369
law in Maryland, Md.....	385	maggot fly in Australia.....	656
toxicity, primary, notes.....	477	management, Wash.....	870
Serums , production and distribution in Hol- land.....	377	manure, fertilizing value.....	737
Sesame cake , analyses.....	467	measurements.....	169
meal for pigs.....	371	microbial flora of large intestine.....	466
oil, detection.....	613	physiological function of pineal gland.....	168
rot bacteria affecting.....	345	pox, immunization.....	680, 681
<i>Sesamia fusca</i> , life history and remedies.....	356	raising in Louisiana.....	469
<i>Sesia castaneæ</i> n.sp., description.....	758	Ontario.....	369
Sewage , disinfection by chlorid of lime.....	512	on the range, treatise.....	666
disposal for rural homes, U.S.D.A.....	194	Rambouillet, in France.....	273
in New South Wales.....	785	rotation of blood plasma and serum in.....	881
notes.....	86	scab, tobacco dips for, U.S.D.A.....	194
methods of analysis.....	408	Tasmanian Merino, notes.....	572
pollution in lower Missouri River.....	512	tick, life history, Wyo.....	756
purification at Atlanta, Georgia.....	617	wild, origin and distribution.....	469
sedimentation tank, new type.....	293	wireworm, life history.....	476
utilization.....	617	Shellac, detection in ethyl alcohol.....	312
Sewer pipe , specifications.....	290	Shellfish, bacteriological examination.....	814
tests.....	685	Ship stuff, analyses.....	467
Sewers , design and construction.....	182	Ky.....	270
Sewing clubs for girls, notes.....	395	Shorthorns, dairy, breeding and selection....	473
Sex heredity. (<i>See</i> Heredity of sex.)		Shorts, analyses.....	467, 769
Shade , effect on plant growth, U.S.D.A.....	130	Can.....	270
Shallu , culture experiments, Ariz.....	426	Ky.....	270
notes.....	141	Shot hole borer, notes, Oreg.....	158
Shea butter , detection.....	613	Showers, midsummer, at Galveston, Texas, U.S.D.A.....	812
Sheep , anthrax affecting.....	582	Shrubs, culture in western Nebraska, Nebr..	546
botfly, life history and remedies.....	761	of New Mexico, N. Mex.....	842
notes.....	856	Oklahoma.....	441
breed characteristics.....	369	ornamental—	
breeding experiments.....	171, 370, 669	adaptation and variety tests, U.S.D.A.....	41
Mo.....	870	breeding experiments, Can.....	235
N.H.....	771	culture.....	148
for fur.....	872	experiments, Can.....	235
in Alaska, Alaska.....	771	in Alaska, Alaska.....	743
British breeds.....	571	notes.....	395
carcass competition.....	369	varieties, Can.....	235
castration.....	168	U.S.D.A.....	540
cells, formalinized, use in complement fixation tests.....	676	relation between root habit, ground water, and species distribution....	136
Corriedale, notes.....	469	treatise.....	842
dairy farming with.....	376	<i>Signiphora lutea</i> n. sp., description.....	359
domestic, origin.....	469	<i>nigrata</i> , parasitic on San José scale.....	758
Dorset Horn, notes.....	572	Silage, analyses, Can.....	270
dressing and skinning.....	469	Wis.....	367
factors affecting pulse rate.....	66	crops for, Kans.....	575
fat-tailed, notes.....	572	for beef production, Nebr.....	771
feeding.....	572	lambs, Can.....	271
and management.....	469	sheep.....	572
Idaho.....	870	steers, Mo.....	667
experiments.....	169, 170, 367, 369	summer feeding.....	473
Can.....	272	from dry corn fodder, Vt.....	769
grazing, relation to wood ticks.....	658	handbook.....	87
horn growth as affected by castration.....	772	importance in southern beef produc- tion, N. C.....	60
improvement, U.S.D.A.....	299		

	Page.		Page.
Silage, lactic acid in, Iowa	712	Snowbirds, destruction of grain aphids by, U.S.D.A.	453
making and feeding, U.S.D.A.	869	Snowfall in Columbia River Basin, U.S.D.A.	510
notes.....	689	measurement, U.S.D.A.	121, 510
nutritive value, Hawaii.....	270	Snuff, analyses, N. Dak.	866
stack system.....	768	Soap, detection in ethyl alcohol.....	312
tests.....	633	methods of examination.....	811
Silica from feldspar.....	518	Social survey in southern Minnesota.....	489
Silicates as a source of potash.....	215, 518, 822	Society for Horticultural Science, proceedings	40
decomposition by bacteria.....	316	Sodium—	
weathering.....	123	arsenate, tick-killing properties.....	680, 886
Silicic acid, soluble, in phosphatic slag.....	409	toxicity.....	586
Silk culture in Yalung Valley.....	655	arsenite, destruction of weeds by, Hawaii	748
Silkworm pebrine, notes.....	762	oxidation in dipping tanks.....	555
Silkworms in Madagascar and Reunion.....	855	toxicity.....	536
Silos and silage, notes, Hawaii.....	270	benzoate, notes, N. Dak.....	865
comparison of different types.....	489	bicarbonate in artesian water of Virginia.	512
construction.....	489, 689, 789	bisulphate, use in manufacture of phosphatic fertilizers.....	319, 418
Nebr.....	593	carbonate, effect on germination of seeds.	328
handbook.....	87	chlorid. (<i>See</i> Salt.)	
notes.....	473	determination, Ohio.....	807
Silver nitrate, effect on germination of barley.	629	in foods.....	809
salts, effect on <i>Aspergillus niger</i>	554	nitrate. (<i>See</i> Nitrate of soda.)	
Simulium larvae, parasites of.....	856	phosphate, effect on germination of seeds.	328
oviposition of Brazilian species....	54	salts, effect on composition of plants, R.I.	419
<i>Simulium meridionale</i> . (<i>See</i> Turkey gnat.)		concrete.....	891
spp., notes, U.S.D.A.....	454	plants.....	625
<i>Siphocoryne avenæ</i> . (<i>See</i> Grain aphid, European.)		soziodolate, use against spirochetosis in fowls.....	484
Siricidae of North America.....	359	sulphate, effect on germination of seeds..	328
Sirup evaporator, description, Fla.....	833	sulphite, physiological action.....	269
Sirups, table, food value, U.S.D.A.....	460	thiosulphate, assimilation by yeast and mold fungi.....	29, 30
Sisal anthracnose, notes.....	346	fertilizing value.....	521
fiber, strength of, U.S.D.A.....	313	Soil acidity as affected by fertilizers, Fla....	238
industry in Hawaii, Hawaii.....	208	notes.....	816
lactic acid in.....	615	Wis.....	623
Siskin, pine, destruction of grain aphids by, U.S.D.A.	452	studies, P.R.....	815
Skim milk, analyses.....	471	analyses, error in.....	316
ash analyses, Ohio.....	861	value to the farmer.....	512
dried casein from.....	676	bacteria, migration of, N.C.....	21
for calves.....	668	relation to angleworms.....	316
standards, U.S.D.A.....	777	studies.....	221
testing, Kans.....	879	bacteriology, investigations.....	422
Skunks, breeding for fur.....	672	studies, N.C.....	21
Slag, methods of analysis.....	795	conditions in United States and western Canada, handbook.....	596
use in manufacture of fertilizers, U.S.D.A.....	25	experiments at New York Cornell Station	820
(<i>See also</i> Phosphatic slag.)		fatigue, notes.....	243
Slaughterhouses, inspection in Virginia.....	766	fertility—	
Sleet storm in northern New York, U.S.D.A.	510	as affected by alfalfa.....	633
Slime, formation in soils.....	723	barnyard manure....	317
Slop, dried, methods of analysis.....	311	conservation and improvement.....	125
Sludge, fresh and decomposed, comparison..	625	investigations.....	416
utilization.....	625	S. Dak.....	728
Smith, J. B., writings of.....	353	maintenance, Ill.....	623
Smoke, effect on plant growth.....	422	Ohio.....	213
life, bibliography.....	630	relation to fertilizers.....	213
toxicity toward plants.....	131, 529	fungi.....	824
Smudging, cost of.....	339	formation, relation to forest cover.....	643
Smut. (<i>See</i> Barley smut, Corn smut, etc.)		inoculating alfalfa with, Nebr.....	332
Snakes, experiments with.....	476	inoculation, notes.....	417
Snow, fertilizing value, Can.....	209	under lime deficiency.....	820
relation to forests.....	814	moisture—	
irrigation and forestry.....	813	as affected by alfalfa.....	634
survey in Nevada, U.S.D.A.....	510	cropping, N. Dak.....	425
surveys for predicting stream flow....	314		
in Utah, U.S.D.A.....	721		

	Page.		Page.
Soil moisture—Continued.		Soils, evaporation from	125
coefficient.....	626	N.Dak.....	211
conservation, Ariz.....	725	fertilizer requirements.....	521
N.Dak.....	211	forest, as affected by silvicultural prac-	
investigations, N.Mex.....	620	tices.....	343
studies, Nebr.....	724	bacterial activity in.....	325
organisms, steam-formalin treatment for.....	645	glacial, of Indiana.....	815
productivity, increasing.....	329	graphite, effect on plants.....	19
judging.....	820	handbook.....	193
sanitation, relation to cereal cropping..	516, 820	highland, acidity in.....	816
solutions—		hygroscopic coefficient, Nebr.....	724
plants as indicators of relative density	212	importance of colloids in.....	817
preparation.....	203	improvement, Ill.....	820
sterilization—		increasing organic matter in, U.S.D.A.....	540
effect on plant food production.....	122	irrigated, drainage.....	684
studies.....	221	laboratory exercises on.....	598
surfaces, penetration by rain, Ariz.....	426	lessons on.....	395
surveys in Indiana.....	815	lime requirement.....	797
United States, U.S.D.A.....	16	loess, origin.....	415
temperature—		loss of fertilizers from, Fla.....	211
investigations, Mich.....	618	lysimeter investigations.....	125
relation to plant growth.....	19	manual.....	315
variation, relation to crop production...	416	marling.....	19
water, composition as affected by culti-		methods of analysis.....	308
vation and manures.....	416	micro-organisms in.....	122, 123, 515
Soling crops for summer feeding.....	473	mineralogical examination.....	19
Soils, Actinomycetes in.....	222	moor, as affected by lime.....	823
alkali, reclamation with Bermuda grass,		effect of mixing with lighter soil.....	19
U.S.D.A.....	330	fertilizers for.....	516
analyses.....	119	of northwest Germany, studies..	514
arid, nitrification in.....	21, 211	nitrate formation in, N.Y.Cornell.....	818
as affected by—		nitrification in, Va.....	621
frost.....	212	nitrogen fixation in, Colo.....	621
fungus parasites of plants.....	150	of California, distribution of humus in.....	415
lime, Hawaii.....	210	Colorado, ammonifying efficiency	
sterilization, N.Y.Cornell.....	22	and algal content.....	819
volcanic ash, Alaska.....	726	Cuba, analyses and fertilizer needs..	416
<i>Bacillus radicola</i> in.....	423	Egypt, permeability.....	816
bacterial activity in.....	123, 817	Florida, classification and use.....	416
Mich.....	20	Everglades, analyses.....	315
bacteriological examination, Iowa.....	824	Hartford quadrangle, Kentucky.....	513
behavior of amino acids in.....	124	India, bacteriological analysis.....	220
calcareous—		Iowa, bacterial content.....	515
relation to pineapple chlorosis, P.R.	623	Kamerun, analyses.....	727
utilization.....	632	La Salle County, Illinois, Ill.....	727
citrus, fertilization.....	317	Malay, analyses.....	727
clay, fixation of ammoniacal nitrogen by	127	Minnesota, origin.....	830
conserving moisture in, P.R.....	85	Mississippi, notes, Miss.....	416
crop-limiting factors in.....	515	Nebraska, bacteria in.....	733
cultivated, absorption by.....	315	New Zealand, analyses.....	728, 730
decline in productiveness..	516	Northwest, fertilizer requirements.....	821
denitrification in.....	817	Obrigheim and Colgenstein, Bavaria.....	125
determination of protozoa in.....	123	Porto Rico, studies, P.R.....	17, 622, 815
distribution and loss of lime in, Md.....	128	Quebec and Ontario, analyses.....	233
dried, bacteriological studies.....	325	South Africa, analyses.....	514
effect on—		South Dakota, notes, S. Dak.....	19
composition of wheat, Wash.....	834	southern Italian Somaliland.....	416
marsh plants.....	531	Sulphur Spring Valley, Ariz.....	725
root crops.....	577	Sutter Basin, California, U.S.D.A.....	125
substances in suspension and in so-		Tennessee, lime for, Tenn.....	25
lution.....	19	Utah, studies, Utah.....	18
vegetation.....	513	western Australia, fertility.....	315
wheat.....	835	Yamethin district, Burma, analyses..	736
erosion as affected by forests.....	842	organic constituents of.....	817
by wind.....	811	osmosis in.....	124
other and chloroform extracts of, Tex..	801	packing experiments, Can.....	223

	Page.		Page.
Soils, peat, as affected by lime.....	823	Soy beans, analyses, Wis.....	367
deposits in Virginia coastal plain.....	513	ash analyses, Ohio.....	861
reclamation and improvement.....	890	culture and use.....	142
Tunis phosphate for.....	519	N.J.....	536
phosphorus requirements, R.I.....	417	experiments, Ohio.....	432
pineapple, analyses, Hawaii.....	210	Wash.....	32
plowing and cultivation, Cal.....	31	in Porto Rico, P.R.....	631
radiating power, Mich.....	618	effect on nitrate content of soils,	
red, fertilizer requirements, P.R.....	623	N.Y.Cornell.....	818
formation.....	514	fertilizer experiments.....	830
P.R.....	622	Ohio.....	137
reduction of salt content, U.S.D.A.....	32	irrigation, N.Mex.....	621
relation to plants.....	212	notes.....	865
weeds.....	30, 523	relation to weather conditions,	
sewage-sick, protozoa from.....	316	Tenn.....	616
slime formation in.....	723	varieties, N.C.....	31
solubility of nitrogenous compounds in.....	108	Ohio.....	31, 137, 432
sterilization by caustic lime.....	730	<i>Spalangia muscae</i> , notes.....	257
sterilized and reinoculated, water-solu-		<i>muscidarum</i> n.sp., description.....	359
ble matter in, N.Y.Cornell.....	22	Sparrows, destruction of grain aphids by,	
tillage.....	634	U.S.D.A.....	452
tobacco, of Del.....	815	<i>Spartina glabra</i> , analyses, Can.....	270
tropical, selection.....	727	Spectrophotometry of the blood.....	408
truck, of Atlantic coast region, U.S.D.A.....	416	Speeds, calculating.....	389
usar and regur, of India.....	514	<i>Spegazzinia ornata</i> , notes.....	647
viable weed seeds in.....	836	Speisefett, notes.....	564
volcanic loam, of Japan.....	18	Spelt, culture in Texas Panhandle, U.S.D.A.....	429
warping, in England.....	514	varieties, Can.....	222
<i>Solanum</i> spp., bud variations in.....	829	Sperm iso-agglutinins, production by ova.....	167
Solar halo, notes, U.S.D.A.....	121	Spermatoxin, effect on female organism and	
<i>Solenopsis geminata</i> , injurious to okra.....	653	egg.....	167
sp., parasitic on bee moth, Tex.....	860	Spermatozoa, transportation.....	66
<i>Solidago sparsiflora subcinerea</i> , notes, Ariz.....	441	Spermatozooids, effect on the blastula.....	66
Solids, determination in fruit juices and jel-		<i>Sphacelia scirpicola</i> , notes.....	345
lies.....	798	<i>Sphacelotheca sorghi</i> , notes, Conn. State.....	547
Soot, fertilizing value.....	129	<i>Sphaerella caricæ</i> n. sp., studies.....	849
Sorghum—		<i>macularis</i> , notes.....	51
as a forage crop, Nebr.....	225	spp., notes.....	345
crops for silage, Kans.....	575	<i>tremulicola</i> , notes.....	51
culture experiments, Nebr.....	225	<i>Sphzeropsis</i> —	
Early Amber, as a dry-land crop, Ariz.....	736	<i>malorum</i> , description and treatment....	752
formation of sugar in.....	409	notes, N. H.....	748
grain, culture in Texas Panhandle,		and treatment, N. C....	49
U.S.D.A.....	429	spp., relation to citrus gummosis, Fla....	247
midge, notes.....	252	<i>Sphzerostilbe coccophila</i> , notes.....	852
new variety, notes, U.S.D.A.....	141	<i>Sphzerotheca humuli</i> , notes, Conn. State.....	547
notes.....	395	studies, N.Y.Cornell.....	346
varieties.....	535	<i>mors-uvæ</i> , treatment.....	249
Ariz.....	426	Sphagnum, relation to formation of upland	
P.R.....	631	moors.....	124
water requirements, U.S.D.A.....	826	<i>Sphenophorus parvulus</i> , notes.....	252
yields, U.S.D.A.....	32	N.C.....	52
Sotol, notes, Ariz.....	441	spp., investigations, N.C.....	56
South Carolina Station, notes.....	98, 399	<i>Spicaria colorans</i> , notes.....	547
South Dakota College, notes.....	700	Spices, value in the diet.....	664
Station, notes.....	700	Spider, red, notes, U.S.D.A.....	360
Soy bean cake, analyses.....	467	studies and bibliography,	
Hawaii.....	270	U.S.D.A.....	261
composition, Del.....	712	Spiders, natural enemies of.....	262
for cows.....	577	Spiderwort, notes, Ariz.....	441
v. cotton-seed cake for cows.....	172	Spinach flea beetle, notes, Can.....	761
hay, ash analyses, Ohio.....	861	U.S.D.A.....	456
meal for pigs.....	371	insects affecting.....	556
oil, detection.....	613	<i>Spinus pinus</i> , destruction of grain aphids by,	
studies, Del.....	712	U.S.D.A.....	452

	Page.		Page.
Spirea, culture in Alaska, Alaska.....	743	Stable fly, relation to pellagra.....	756
<i>Spirochæta gallinarum</i> , cultivation.....	588	surra.....	760
<i>suis</i> , studies.....	682	studies.....	559
<i>theileri</i> , relation to anaplasmosis..	584	manure. (See Barnyard manure.)	
<i>Spirochetæ</i> , photomicrographs of.....	478	Stains, use in study of bacteria, Va.....	630
<i>Spirochetes</i> , notes.....	563	Stalk borer, notes.....	252
<i>Spirochetosis</i> in fowls, immunization.....	588	Stallions, breeding.....	370
treatment.....	484	care and management, Kans.....	873
résumé.....	883	certification in Victoria.....	471
<i>Spizella</i> spp., destruction of grain aphids by,		in Kansas, Kans.....	873
U.S.D.A.....	542	<i>Staphylococcus pyogenes aureus</i> , lipase of....	177
Splices, methods of making.....	390	Starch, determination.....	716
<i>Spodoptera mauritia</i> , notes.....	456	in meat and fish prod-	
<i>Spogostylum anale</i> , life history.....	456	ucts.....	798
<i>Spondylocladium</i> —		effect on geotropism in roots.....	322
<i>atrovirens</i> , studies and bibliography,		factory wastes, fertilizing value.....	129
U.S.D.A.....	347	grains, studies.....	409
<i>maculans</i> n. sp., relation to rubber spot-		industry in Germany.....	209
ting.....	451	products, composition and use,	
<i>Spongopora solani</i> , occurrence in Maine.....	550	U.S.D.A.....	460
<i>subterranea</i> , notes.....	448	variation in leaves.....	827
<i>Sporobolus depauperatus</i> , analyses, Can.....	270	Steam pipe systems, installation in dairies...	893
Spotted fever tick, biology.....	359	plowing in Bombay Presidency.....	592
notes, Mont.....	652	Stearic acid, detection in ethyl alcohol.....	312
Spraying apparatus, notes, Ark.....	640	Steel, welding.....	593
calendar, Wash.....	42	Steers, breeding, effect on gains, Tenn.....	667
experiments.....	354	cotton-seed meal for, N.C.....	77
Ark.....	640	digestion experiments, Md.....	366
Fla.....	262	feeding experiments.....	169, 367, 368, 870
Me.....	145	Can.....	271, 272
machinery, accessories, Ohio.....	87	Fla.....	272
notes.....	353, 593	Mo.....	667
tests.....	292	Nebr.....	771
mixtures, adherent, notes.....	554	Tenn.....	666, 667
effect on germination of		fish meal for.....	270
grape pollen.....	839	sheltering experiments, Can.....	271
notes.....	436	<i>Stegomyia fasciata</i> , studies, Hawaii.....	252
Ky.....	640	<i>Stenomacra</i> sp., parasites of.....	358
Mich.....	146	<i>Stephanurus dentatus</i> , localization and devel-	
nozzles, tests, Ark.....	640	opment in hogs.....	783
Springs and ground water, text-book.....	15	<i>Stereum purpureum</i> , notes.....	46, 847
relation to public health.....	512	<i>Sterictiphora lineata</i> , notes.....	252
Spruce aphid, outbreak in England and Ire-		<i>Sterigmatocystis nigra</i> , utilization of glucinium	
land.....	757	by.....	28
as affected by origin of seed.....	841	<i>sydowi</i> n. sp., notes.....	345
bud worm, notes, Can.....	252	Sterility and contagious abortion in cows, Cal.	81
studies, Me.....	255	Mich.....	80
effect of early thinnings on stands...	240	Sterilization, effect on plant food in soils....	122
grinding for mechanical pulp,		Stigmas, effect on germination of pollen.....	437
U.S.D.A.....	614	Stijfziekte, paper on.....	476
leaf miners, notes, Me.....	256	<i>Stilbella flavida</i> , notes, P.R.....	650
management in Saxony.....	342	Stillingia tallow, detection.....	613
Norway, fissures in.....	240	Stizolobium beans, culture in P. R.....	631
volume and value accretion in.....	747	Stock. (See Live stock.)	
wood, ethereal oils of.....	504	foods. (See Feeding stuffs, condimen-	
Sputum, tuberculous, chemical properties...	782	tal and proprietary.)	
Squash capsid, notes, Ariz.....	453	Stocks, hybridization experiments.....	433
Hubbard, breeding and marketing...	830	<i>Stomoxys calcitrans</i> . (See Stable fly.)	
Squirrels, ground, control, Mont.....	651	Storage, effect on potatoes, Md.....	230
Stable fly, notes.....	159, 256, 457, 760	seed cotton, U.S.D.A.....	140
Md.....	353	Storm at Dubuque, Iowa, U.S.D.A.....	812
U.S.D.A.....	454, 559	Storms as affected by forests.....	842
parasite of.....	359	in Florida, U.S.D.A.....	721
relation to diseases.....	760	Ohio, U.S.D.A.....	812
infantile paralysis. 358, 559, 560		Virginia, U.S.D.A.....	812

	Page.		Page.
Storms, papers on, U.S.D.A.....	510	Sugar—Continued.	
Strangles streptococcus, specificity.....	883	beet tops, analyses and digestibility	367
<i>Strategus alveus</i> , affecting coconut palms.....	858	webworm, notes, Mont.....	652
Straw, effect on denitrification in soils.....	817	studies.....	54
loamy sand.....	19	beets, analyses.....	113
feeding value, Can.....	271	culture experiments.....	142, 427
Strawberries—		Can.....	223
culture, Ind.....	439	Nev.....	138
Mo.....	745	in Cape of Good Hope	432
experiments, U.S.D.A.....	137	England.....	432
fertilizer experiments.....	145	Java.....	142
Mo.....	745	Ohio, Ohio.....	793
hybridization experiments, Alaska.....	742	South Dakota, S.Dak..	635
new, descriptions, N.Y.State.....	838	distance experiments, U.S.D.A....	32
U.S.D.A.....	436	fertilizer experiments.....	126
preservation.....	312	Ohio.....	137
reducing and nonreducing sugars in.....	503	U.S.D.A.....	137
varieties.....	145	flour from.....	161
Ind.....	439	growth as affected by soils.....	416
vitality of pollen.....	326	insects affecting.....	153
Strawberry flea beetle, notes, Can.....	761	irrigation experiments, N.Dak....	226
juices, studies, Del.....	711	U.S.D.A....	32
pests, notes, Oreg.....	158	seeding experiments.....	427
root louse, notes.....	653	Nev.....	138
Stream flow, predicting.....	314	subsoiling experiments, Ohio.....	137
relation to precipitation,		variability of nitrogen content.....	536
U.S.D.A.....	121, 812	varieties.....	142, 228, 233, 530
gaging, handbook.....	487	Can.....	222
in Wyoming.....	84	N.Dak.....	225
stations, artificial controls for.....	683	Nev.....	138
measurements in Canada.....	683	Ohio.....	137
Streams, contaminated, dangers from.....	880	water requirements, U.S.D.A....	826
in California, notes, U.S.D.A....	510, 721	yields, N.Dak.....	425
pollution.....	617	bibliography.....	719
Street sweepings, analyses.....	823	biochemical detection.....	509
Streptococci of strangles, specificity.....	883	cane, analyses.....	362
Stresses, determination in tunnel sections....	593	basi from.....	118
Strongylosis, encephalic embolic, notes.....	478	borer, notes, P.R.....	52
<i>Strongylus (Hæmonchus) contortus</i> , life		cost of production.....	690
history.....	476	culture.....	833
Strontium, determination in water.....	797	Fla.....	833
Students, high school, standard of living.....	767	experiments.....	739
Stumps, blasting.....	183	P.R.....	37
<i>Sturnella</i> spp., feeding habits, U.S.D.A.....	452	in Porto Rico, P.R.....	95
Subirrigation <i>v.</i> surface irrigation for vegeta-		diseases, descriptions, U.S.D.A....	347
bles, P.R.....	638	notes.....	345, 446, 647, 751
Subsoiling experiments with gelignite.....	785	Fla.....	833
use of explosives in.....	183	P.R.....	45
Sucrose, detection in grape juice and wines....	310	fertilizer experiments.....	736, 739, 830
determination in presence of reduc-		P.R.....	37
ing sugars.....	112	food value, U.S.D.A.....	460
Sudan grass, notes, U.S.D.A.....	233, 428	growth as affected by soils.....	416
Sugar—		improvement by selection.....	536
beet curly top, notes.....	550	industry in Brazil.....	833
studies, U.S.D.A.....	48	insects affecting.....	353, 858
damping-off, causative agent.....	646	Fla.....	833
diseases, notes.....	153	P.R.....	52
review of investigations.....	246	U.S.D.A.....	53
industry in Europe, handbooks.....	142	lime-magnesia requirements.....	520
Germany.....	113	mealy bug, notes.....	854
leaf spot, treatment, U.S.D.A.....	48	mineral and nitrogen composition..	336
pulp. (<i>See</i> Beet pulp.)		pests in British Guiana.....	756
root rot, causative agent.....	646	remedies.....	846
rot, review of investigations.....	550	planting experiments.....	228
seed, germination as affected by		red-rot fungus, studies.....	347
drying, Vt.....	739	sampling, P.R.....	12

	Page.		Page.
Sugar—Continued.		Sulphite-cellulose liquors, utilization	129
cane stemrot or Hawaiian iliau in Louisiana	846	Sulphites, fertilizing value	521
varieties	739, 830	Sulphocide, tests, Md.	146
P.R.	37	Sulphocyanic compounds, assimilation by mold fung	29
composition and use, U.S.D.A.	459	Sulphur—	
date-palm, industry in Bengal.	149	as a fertilizer for rice, Hawaii	232
determination in juices	413	atomic, tests, Md.	146
meats	798	determination in plants	797
potatoes	412	rice, Hawaii	231
presence of peptone	716	effect on <i>Aspergillus fumigatus</i>	30
sugar beets	113	growth of tubercle bacilli	381
effect on digestion	663	hops, U.S.D.A.	13
factory wastes, fertilizing value	129	fertilizing value	25, 26, 215, 319, 521
feeds, analyses	467	mixtures. (<i>See</i> Lime-sulphur mixtures.)	
food value	65	use against potato scab	646
U.S.D.A.	459	Sulphuric acid—	
formation in stalks of corn and sorghum ..	409	determination in foods	809
forms of in fruits	40, 503	displacement by water in leaves	219
in potatoes studies	219	effect on germination of seeds	628, 740
industry in Louisiana	690	fertilizing value	25
Natal	739	industry in United States	517
manufacture	833	production and use in 1911	213
treatise	113, 312	use in irrigation water, U.S.D.A.	330
maple wounds, larvæ in	357	waste, utilization	418
plantations in Queensland, white labor for	896	Sulphuring machines, tests, N.Y. Cornell ..	347
production, handbook	233	Sulphurous acid, effect on white wines	264
reducing and nonreducing, in mangles ..	111	fertilizing value	25
determination in presence of peptones ..	613	physiological action	269
vinegar	798	Sumter County, Ga., soil survey, U.S.D.A. ..	16
variations of in leaves	827	Sun as a fog producer, U.S.D.A.	721
relation to polyneuritis	460	power plants, steam engines for	787
resorption in small intestine	268	spot numbers, Wolf-Wolfer system, U.S.D.A.	721
transformation in the human organism ..	63	Sunflower seed cake, analyses	467
utilization by higher plants	423	for cows	577
(<i>See also</i> Beet sugar and Cane sugar.)		oil, detection	613
Sugarhouse control	413	Sunflowers, varieties resistant to <i>Orobanche cumana</i>	851
Sulla seed, germination energy of	538	Sunlight, actinic power, Hawaii	212
Sulphate of—		effect on composition of wheat, Wash.	834
ammonia—		plant assimilation	26
effect on assimilation of phosphates ..	318	photochemical effects from	218
disease susceptibility in cereals	844	Superphosphate—	
germination of seeds	328	double, preparation	319
legume bacteria	733	effect on composition of turnips, R.I.	418
marsh plants	531	germination of seeds	328
nitric acid, N.C.	21	fertilizing value	228, 319, 418, 519, 624, 632, 635, 737, 829
nitrogen fixing power of Azotobacter, U.S.D.A.	527	Ala. College	335, 336, 831
<i>Penicillium variable</i>	529	Ohio	31, 137
phosphorite	624	U.S.D.A.	330
soils	417	for carnations and roses	840
fertilizing value	23, 125, 127, 213, 829	grass lands	530
Ala. College	831	loss from soils, Fla.	211
for carnations and roses	840	manufacture	418
from ammonia and sulphur dioxid.	24	mixing with calcium cyanamid	24
injurious to fish	821	nitrate	214
loss from soils, Fla.	211	of lime, effect on marsh plants	531
production and use	126, 213, 318, 517	production and use in 1911	213
use against weeds	530	Surgery, papers on	676
potash, effect on germination of seeds ..	328	Surra, immunity to	379
marsh plants	531	transmission by stable flies	760
tomatoes, Md.	339	treatment	176, 883
fertilizing value	632, 829	Swamp lands. (<i>See</i> Lands, swamp.)	
for carnations and roses	840	Swede finger-and-toe disease, treatment ..	752
		Phoma rot, notes, Conn. State	547

	Page.		Page.
Swede silage, analyses, Wis.....	367	Tapeworms in pigs, relation to rabbits.....	482
Swedes, fertilizer experiments.....	125, 632, 833	waterfowl.....	784
rotation experiments.....	227	Tapioca, examination.....	361
seeding experiments.....	432	Tar spraying machines, tests.....	687
yield as affected by time of thinning.....	431	Targonia sacchari, notes, P.R.....	53
Swedish Moor Culture Society, report.....	516	Tarnished plant bug—	
Sweet clover, effect on yield of sugar beets,		false, notes.....	252
U.S.D.A.....	137	N. Y. State.....	354
manual.....	833	relation to peach "stop back".....	354
water requirements, U.S.D.A.....	826	Taro, fertilizer experiments, Hawaii.....	233
corn, heredity of waxy endosperm in,		Tartaric acid—	
U.S.D.A.....	35	as affected by yeast.....	504
variation in, due to fertilizers.....	435	determination in presence of metals.....	808
varieties, Ariz.....	426	wines.....	798
pea diseases, notes.....	450, 650	Tätté, dietetic value.....	475
seedlings as a test for hydrocar-		Taxation, land, notes.....	391
bons.....	132, 529	Tea box industry in Assam.....	440
streak disease, notes.....	352	infusions, combination of caffein and	
peas as affected by pruning, Md.....	339	tannin in.....	463
notes, U.S.D.A.....	299	studies.....	566
rogues in.....	239	manufacture.....	118
vitality of pollen.....	326	notes.....	463
potato dry rot, investigations, U.S.D.A.....	153	oil, detection.....	613
stem rot, causative agent.....	647	seed bug, notes.....	446
potatoes—		treatise.....	265
ash analyses, Ohio.....	861	value in the diet.....	664
culture, N.J.....	536	Teachers, agricultural instruction for.....	297
experiments, P.R.....	637	nature study course for.....	298
fertilizer experiments, P.R.....	637	of rural subjects, qualification.....	296
reducing and nonreducing sugars		Teak, rot bacteria affecting.....	345
in.....	503	Teasel aphid, notes.....	454
storage and marketing, U.S.D.A.....	635	description and culture.....	142
varieties, P.R.....	637	Technology, chemical, treatise.....	413
Sweetmeats, manufacture, treatise.....	264	Teff, brown, culture in Porto Rico, P.R.....	631
Swine. (See Pigs.)		Telenomus sp., rearing and shipping.....	658
Sword beans, culture in Porto Rico, P.R.....	631	sphingis, notes.....	658
Symptomatic anthrax. (See Blackleg.)		Temperature—	
<i>Syrphus xanthostoma</i> , life history.....	456	as affected by forests.....	842
<i>Systates irregularis</i> , notes.....	853	changes, effect on branch movements in	
<i>Systema</i> spp., notes, Can.....	761	trees.....	526
Tabanidae, greenish blood of.....	54	control plant, notes, Tenn.....	658
Tachinidæ, Canadian hosts.....	358	determining probable minimum, U.S.	
<i>Tænia crassicolis</i> , affecting rats.....	755	D.A.....	510, 511
<i>ovis</i> , notes, U.S.D.A.....	887	effect on alcohol yeast.....	714
<i>saginata</i> , studies, U.S.D.A.....	782	bacteria in water.....	814
Takadiastase, notes.....	609	fumigation, N.Y. State.....	762
Talc, relation to polyneuritis gallinarum.....	865	germination and growth of	
Tallow wastes, fertilizing value.....	129	wheat.....	731
Talus slopes, effect on conservation of snow.....	814	milk fat.....	580
Tamar-koji, fungi and composition of.....	161	plant variation, Md.....	339
Tan plants of Iowa.....	626	respiration coefficient of seeds.....	525
Tangelos, paper on.....	839	in soils, relation to bacterial activity.....	423
Tankage, analyses, Ky.....	270	low, effect on grapes.....	839
R.I.....	626	regulator, description.....	567
Wis.....	367	relation to grape roncet.....	349
ash analyses, Ohio.....	861	supramaximal, effect on plants.....	27
fertilizer v. selected, for pigs, Colo.....	872	Tenant farm problems, notes.....	634
production and use.....	517	Tendons, form and function, in limbs of work	
Tannase, formation in <i>Aspergillus niger</i> and		animals.....	570
<i>Penicillium</i> spp.....	132	Tenebrionidæ larvæ injurious to tobacco.....	761
Tannery waste, fertilizing value.....	129	Tennessee Station, financial statement.....	696
Tannin formation, relation to mitochondria.....	827	notes.....	98, 700
Tannins, methods of analysis.....	408	report of directory.....	696
preparation.....	408	University, notes.....	98, 700
Tapeworm, beef, studies, U.S.D.A.....	782	Tent caterpillar, notes, Can.....	558
cysts in mutton, U.S.D.A.....	886	Me.....	251

	Page.		Page.
Tent caterpillar, notes, Oreg.....	158	Ticks, inflammation following bite of.....	585
Teosinte, culture experiments, Ariz.....	426	North American, life histories.....	861
Tepary beans as a dry land crop, Ariz.....	736	relation to African coast fever.....	584
culture experiments, Ariz.....	426	anaplasmosis.....	584
<i>Tephrosia</i> spp., analyses.....	215	spirochetosis.....	853
<i>Terminalia tomentosa</i> , notes.....	443	verruca fever.....	262
Terrapin scale, notes, Md.....	353	remedies.....	680
Terriers, Airedale, prepotency in.....	770	(See also Cattle ticks.)	
Tetanus, immunization, U.S.D.A.....	780	Tile, concrete drain, failures of.....	487
treatment.....	679, 883	drainage, specifications.....	290
<i>Tetranychus</i> —		tests.....	685
<i>bimaculatus</i> , notes, U.S.D.A.....	360	Tillage, new basis for.....	516
studies and bibliography,		<i>Tilletia foetens</i> , treatment.....	750
U.S.D.A.....	261	<i>laevis</i> , notes.....	243
sp., notes.....	853	<i>tritici</i> , studies.....	152
<i>tiliarum</i> , notes.....	58	Timber—	
Tetraplasy, notes and bibliography.....	67	borers affecting.....	761
<i>Tettigonia similis</i> , notes, P.R.....	53	dry rots, studies.....	157
<i>Teucrium scorodonia</i> as affected by light.....	526	fire-killed, insects affecting.....	53
Texas College, notes.....	197	hardwood, as affected by forest fires,	
fever, notes.....	256	U. S. D. A.....	44
ticks. (See Cattle ticks.)		lands of Panama.....	342
treatment, Tenn.....	658	National Forest, sale of, U.S.D.A.....	444
Station, financial statement.....	696	reproduction, relation to grazing,	
notes.....	600	U.S.D.A.....	513
report of director.....	696	yellow pine, tests of strength.....	387
Textile plant fibers, strength of, U.S.D.A.....	312	(See also Lumber and Wood.)	
<i>Thaneroclerus girodi</i> , notes.....	359	Timothy—	
Therapeutics, papers on.....	676	billbug, notes.....	252
physiologic principles in.....	500	breeding experiments.....	635
<i>Theridion</i> spp., notes, Me.....	256	culture experiments.....	631
<i>Thespesia populnea</i> , fertilizing value.....	215	Alaska.....	735
<i>Thielavia basicola</i> , notes.....	245, 549, 650, 753	in the Ozarks, Mo.....	427
<i>Thielaviopsis ethacetica</i> , notes, P.R.....	650	effect on ammonification in soils.....	317
<i>paradoxa</i> , notes.....	345, 647	nitrate content of soils, N. Y. Cor-	
Thiosulphate, fertilizing value.....	521	nell.....	818
Thistle, Canada, distribution and destruction,		nitrification in soils.....	317
U.S.D.A.....	538	hay, ash analyses, Ohio.....	861
Thomas slag. (See Phosphatic slag.)		seed, germination and purity tests, Vt...	741
Thorium X, effect on plant growth.....	131	seeding experiments on ranges, U.S.D.A...	531
Threshing machine, hand, description, U.S...		varieties.....	139
D.A.....	87	yields, Mont.....	631
power for.....	892	Tissue, living, methods for studying.....	408
Thrips injurious to alfalfa.....	252	Titanium in pineapple soils, Hawaii.....	210
notes, Can.....	252	Titlarks, destruction of grain aphids by,	
<i>Thrips tabaci</i> . (See Onion thrips.)		U.S.D.A.....	453
Thunderstorm at Macon, Georgia, U.S.D.A...	812	“T’Kirriemoor” roots as a substitute for	
Washington, U. S. D. A.....	812	yeast.....	461
Thunderstorms in Kansas, U.S.D.A.....	510, 721	Tobacco—	
<i>Thurberia thespesioides</i> , host plant of cotton-		analyses, N. Dak.....	866
boll weevil.....	458	animals affecting.....	551
<i>Thyridaria tarda</i> , notes.....	548, 647, 749	bacterial disease, notes.....	423
relation to rubber spotting.....	451	breeding.....	538
<i>Thyridopteryx ephemeraeformis</i> . (See Bag-		experiments, Conn.State.....	536
worms.)		chemistry, progress in.....	413
Thyroid secretion, relation to metabolism...	868	culture.....	538
Thysanoptera of France.....	853	in Burma.....	736
Tick bird, red beaked, notes.....	585	Canada.....	233
fever. (See Texas fever.)		Gironde.....	233
Rhodesian. (See African coast		curing.....	538
fever.)		diseases, notes.....	550
infestation in Natal.....	585	extract fumigation, Ky.....	640
Ticks, destruction by arsenical dips.....	886	extraction of nicotine from.....	118
eradication, Ala. College.....	585	fertilizer experiments.....	233
in the South.....	500	N. Y.State.....	22

	Page.		Page.
Tobacco—Continued.		<i>Tradescantia scopulorum</i> , notes, Ariz.....	441
green manure for.....	215	<i>Tragocephala pretiosa</i> , notes.....	853
growth as affected by soils.....	416	<i>Trametes pini</i> , notes.....	851
hornworms, remedies, U.S.D.A.....	356	Transpiration in—	
insects affecting.....	353, 551, 653, 756	leaves, resistance to.....	217
plant, nicotin content.....	503	plants, studies and bibliography.....	524
rot bacteria affecting.....	345	Tree crickets, notes.....	354
seed, cleaning.....	144	diseases in Federated Malay States.....	552
germination.....	739	notes.....	446, 552, 851
smoke, effect on plants.....	30, 131	shoots, analyses.....	570
treatise.....	265	Trees as affected by grass.....	339
<i>Tomaspis postica</i> , notes.....	353	oxalic compounds.....	49
Tomato canker, notes.....	847	ascent and descent of water in.....	524
clubs in Virginia.....	599	autumn twig cast.....	217
diseases, description and treatment,		blasting.....	183
Fla.....	847	bleeding, notes.....	357
notes.....	245	branch movements in.....	526
Cal.....	540	cost of pulling.....	389
leaf spot, treatment, Ind.....	435	culture in western Nebraska, Nebr....	546
seedlings, transplanting, Ind.....	435	defoliated, growth in.....	643
thrips, remedies, Fla.....	251	diameter growth, causes.....	342
Tomatoes—		dormant, as affected by petroleum	
canned, examination.....	60	products.....	354
methods of analysis.....	799	form as affected by wind.....	27
cost of distribution.....	492	growth as affected by soils.....	416
culture.....	395	indigenous, of Hawaii, treatise.....	643
Cal.....	540	individual selection experiments.....	441
Del.....	744	insects affecting, Can.....	252
Ind.....	434	North American, distribution, U.S.D.A.	149
U.S.D.A.....	193	of Alaska.....	342
experiments, Idaho.....	540	America, treatise.....	441
in Burma.....	736	Great Britain and Ireland, treatise...	747
fertilizer experiments, Ind.....	434	Michigan.....	43
N. Y. State.....	22	New Mexico, N. Mex.....	842
greenhouse, investigations, Oreg.....	145	Oklahoma.....	441
irrigation experiments, P. R.....	638	ornamental, adaptation tests, U.S.D.A.	41
lycopin and carotin in.....	132	breeding experiments, Can.....	235
parthenogenesis in.....	837	culture.....	148
<i>Phytophthora infestans</i> affecting.....	445	experiments, Can.....	235
preservation.....	312	notes.....	395
reducing and nonreducing sugars in.....	503	varieties, Can.....	235
variations in, Md.....	339	U. S. D. A.....	41, 540
varieties, Can.....	235	planting with dynamite.....	339
Del.....	745	relation between root habits, ground	
Ind.....	434	water, and species distribution.....	136
Oreg.....	145	sap ascent in.....	524
susceptible to <i>Fusarium</i> wilt..	436	treatise.....	842
variety tests, difficulties in.....	41	winter and frost injuries.....	851
Tor grass, description and eradication.....	142	Trefoil seed, germination energy of.....	538
Tornado in western Montana, U.S.D.A.....	722	Trematodes, injurious to muskrats.....	454
Tornadoes, papers on, U.S.D.A.....	510	Trembling in sheep.....	681
<i>Tortrix fumiferana</i> , notes, Can.....	252	<i>Triaspis vestitica</i> n. sp., description.....	563
<i>viridana</i> , notes.....	558	Trichinosis in dogs and cats.....	83
<i>Torula pulcherrima</i> , notes.....	116	<i>Trichogramma minutum</i> , notes.....	658
<i>Toxoplasma canis</i> , studies.....	484	(<i>pretiosa</i>), notes,	
<i>Toxoptera graminum</i> , destruction by birds,		U.S.D.A.....	53
U.S.D.A.....	452	<i>Tricholoma personatum</i> , prevalence in South	
<i>Toxotrypana curvicauda</i> , notes, P. R.....	652	Africa.....	461
<i>Toxylon pomiferum</i> as a source of rubber.....	546	<i>Trichoseptoria fructigena</i> , notes.....	247
Traction gear, description and tests.....	389	<i>Trichostrongylus</i> n. spp., descriptions.....	555
Tractors, agricultural, notes.....	185	<i>Trichotoxon heyneimanni</i> , notes.....	853
gas, standardization.....	185	<i>Trifolium alexandrinum</i> , notes.....	140
oil, for the farm.....	893	spp., studies.....	522
steam, indicator for testing.....	389	Trimethylamin in dried herring roe.....	863
tests.....	86, 390	Trinitrotoluene waste, utilization.....	319
use in pulling trees.....	389	<i>Trionymus violascens</i> n. sp., description.....	255
<i>Tradescantia</i> root hairs as affected by bog		<i>Triphleps tristicolor</i> , notes, U.S.D.A.....	261
water.....	523	<i>Tritoxa flexa</i> , notes, U.S.D.A.....	454

	Page.		Page.
<i>Trocarocephalus strangulatus</i> , notes.....	858	Tuberculosis—Continued.	
<i>Trogoderma tarsale</i> , life history and habits...	55	bovine, early stages.....	286
Truck crops, culture on Yuma irrigation		eradication.....	286, 287
project, U.S.D.A.....	226	Ill.....	78
fertilizers for, treatise.....	837	immunization.....	384, 480, 499
insects affecting, Okla.....	853	Cal.....	884
varieties, U.S.D.A.....	540	investigations.....	178
soils of Atlantic coast region, U.S.D.A.....	416	notes, Cal.....	79
Trypanblue, use against Texas fever, Tenn..	658	prevention.....	886
<i>Trypanosoma americanum</i> , studies.....	680	treatment.....	384
<i>equiperdum</i> in European Russia.....	479	cause and eradication.....	179
Trypanosome diseases, immunity to.....	379	chemotherapy.....	481
immunization.....	380	diagnosis.....	285, 382, 583
treatise.....	77	equine, investigations.....	385
Trypanosomes—		symptomatology.....	479
effect on heat production in rabbits.....	479	eradication from herds.....	500, 886
immunity reactions with.....	176	human and bovine, relation.....	479, 884
of Zululand.....	476	control.....	382
photomicrographs of.....	478	immunization.....	884
Trypanosomiasis, treatment.....	476, 676	immunization.....	481, 584, 782, 886
<i>Trypeta ludens</i> . (See Orange maggot.)		Ill.....	79
Trypsin, generation from trypsinogen.....	662	in camels, treatment.....	676
hydrolysis of casein by.....	202	children, types of bacilli in.....	286
Tubercle bacilli—		nursing children.....	382
bovine, in children.....	382	pigs, dissemination by fowls.....	479
man.....	382	notes, Cal.....	79
viability.....	381	the college herd, Pa.....	885
detection.....	583	university herd, Ill.....	78
in circulating blood.....	480	laryngeal and tracheal, etiology.....	178
excreta of bovines.....	383, 384	lectures on.....	884
excretion into milk.....	583	methods of infection.....	884
fate outside the animal body, Ill.....	77	“Much granules” in.....	178
human and bovine, differentiation.....	382	notes.....	499
in tuberculous chil-		open, detection in bovines.....	384
dren.....	286	relation to Johne's disease.....	284
in milk of vaccinated cows.....	583	review of literature.....	582
in bile of tuberculous animals.....	582	Tuberculous foci, old, virulence in bovines...	479
human sputum.....	382, 582	sputum, chemical properties....	782
isolation and preparation from diseased		tissue as antigens in complement	
organs.....	381	fixation reaction.....	285
lipase of.....	177	Tubers, edible. (See Root crops.)	
lipoid-free, immunizing tests with.....	782	Tubes, circular, stress analysis of.....	593
new culture medium for.....	380	Tulip tree, fertilizing value.....	215
nutrition with mineral substances.....	381	Tulucuna fat, detection.....	613
permeability for fat soluble dyes.....	177	Tumors, plant and animal, comparison.....	548
spores, studies.....	582	treatment.....	476
vitality of.....	178	Tunis grass, notes, U.S.D.A.....	233, 428
Tubercles, permeability for fat-soluble dyes..	177	Turkey gnat, notes, U.S.D.A.....	454
Tubercular processes, determination of age..	381	Turnip flea beetle, notes, Can.....	761
Tuberculin—		Turnips—	
effect on nontubercular guinea pigs.....	480	composition as affected by phosphorus in	
retests with, Cal.....	885	soils, R.I.....	417
test in North Carolina.....	383	culture experiments.....	138, 427
notes, Ill.....	79	effect on composition of milk.....	277
Pa.....	885	fertilizer experiments.....	126, 213, 227, 228
paper on.....	499	N.Y.State.....	22
reliability.....	178, 179	heredity of form and color in.....	332
tests, comparison.....	583	rotation experiments.....	227
Tuberculosan, notes.....	886	seeding experiments, Can.....	224
tests.....	384	thinning experiments.....	432
Tuberculosis—		varieties.....	228, 530
active and inactive in bovines, differentia-		Can.....	222
tion.....	583	Turpentine—	
antigens in.....	583	detection in ethyl alcohol.....	312
avian, blood picture in.....	285	oil, distillation and composition.....	719
notes, Can.....	273	Twig borer, notes.....	657
biochemistry and chemotherapy of.....	177	<i>Tylenchus devastatrix</i> , notes.....	150
bovine, diagnosis.....	178	treatment.....	151
Cal.....	885		

	Page.		Page.
<i>Tylenchus</i> sp., notes.....	445	Vanilla extract, methods of analysis.....	798
<i>tritici</i> , notes.....	243	value in the diet.....	664
<i>Typha</i> spp., culture and selection experi- ments.....	531	varieties, P.R.....	642
studies.....	522	Variety tests, value.....	329
<i>Typhlocyba comes</i> . (See Grape leaf-hopper.)		(See also various crops, fruits, etc.)	
Typhoid fever epidemic at Rock Island, Illi- nois.....	617	Varnishes, methods of examination.....	811
fly. (See House flies.)		<i>Vascuromyces xanthosomæ</i> n. sp., description.	345
Tyrosin as a source of ammonia, Iowa.....	723	Vegetable—	
content of proteins.....	465	diseases in Wurttemberg.....	845
<i>Udamoselis pigmentaria</i> , notes, U.S.D.A.....	54	fats. (See Fats.)	
Udder, histological appearances.....	278	foods, cooked, analyses.....	659
<i>Ulmus campestris</i> , variations in salt content.	28	of German Africa.....	59
Ultraviolet rays—		growing, bibliography.....	436
coagulation of proteins by.....	130, 131	industry in South Australia.....	837
effect on vegetation.....	130	oils. (See Oils.)	
sterilization of water by.....	415	pear, notes.....	461
Umatilla Experiment Farm, work, U.S.D.A.....	540	products, marketing, U.S.D.A.....	492
<i>Uncinula spiralis</i> . (See Grape powdery mil- dew.)		proteins. (See Proteins.)	
Uncompahgre Valley area, Colo., soil survey, U.S.D.A.....	17	Vegetables—	
Underground water. (See Water.)		ash analyses, Ohio.....	861
United States Department of Agriculture—		blanching.....	867
and Experiment Stations, relationship...	604	breeding experiments, Can.....	235
Bureau of Animal Industry, report.....	793	confectionery from.....	60
laws relating to.....	899	coppered, effect on nutrition and health, U.S.D.A.....	762
Library, accessions.....	299, 599	culture.....	840
Office of Experiment Stations, report.....	899	experiments.....	235, 331
reports.....	496	Ariz.....	426
Weather Bureau. (See Weather Bureau.)		Can.....	235
yearbook.....	496	P.R.....	638
yearbooks, index.....	599	U.S.D.A.....	137, 338
Uranium nitrate, effect on growth of <i>As- pergillus niger</i>	422	in Alaska, Alaska.....	743
oxid, effect on germination of seeds.....	528	exhibiting.....	745, 898
fertilizing value.....	731	fertilizer experiments.....	235
Uranyl sulphate, effect on germination of seeds.....	828	insects affecting.....	852
Urea, decomposition by mold fungi.....	28	marketing cooperatively.....	392
Uredineæ on <i>Carex</i> in North America.....	750	notes.....	338
<i>Uredinopsis</i> spp., hosts of.....	645	nutritive value.....	60
<i>Uredo ericæ</i> n. sp., notes.....	49	of California, handbook.....	435
<i>gossypii</i> , notes.....	548	Jamaica, notes.....	145
<i>muellerii</i> , notes and treatment, N.C.....	50	pollination experiments.....	235
Uric acid, decomposition by mold fungi.....	28	preparation.....	60
excretion as affected by light and dark meat.....	663	selecting and staging for exhibition.....	898
Urine, conservation of phosphates in.....	317	spraying experiments.....	235
detection of substances in.....	408	use in the dietary, Ohio.....	862
of male bovines, apparatus for collec- tion.....	408	varieties.....	235
<i>Urocystis cepulæ</i> , description and treatment.	845	Can.....	235
<i>tritici</i> , treatment.....	845	(See also specific kinds.)	
<i>Uscana semifumipennis</i> , notes, Hawaii.....	253	Vegetation—	
<i>Ustilaginoides virens</i> , notes.....	445	as affected by chemical fumes.....	547
<i>Ustilago antherarum</i> , infection studies.....	552	soils.....	513
spp., behavior of cells and nuclei during development.....	46	ultraviolet rays.....	130
Utah College, notes.....	99	of Sable Island, Can.....	242
Station, notes.....	900	Velvet beans—	
<i>Utetes anastrephæ</i> n. sp., notes, P.R.....	652	analyses.....	271, 569
Vaccine and serum therapy, notes.....	377	hybridization experiments, Fla.....	228
<i>Vachellia farnesiana</i> , notes, Ariz.....	441	v. cotton-seed meal for cows, Fla.....	576
Vacuum cleaning, notes.....	593	Vengai, notes.....	443
<i>Vallisneria spiralis</i> , growing for wild ducks..	373	Ventilation and heating, treatise.....	390
<i>Vanessa californica</i> , notes.....	356	relation to respiration of fruits..	135
		Vermont Dairymen's Association, report....	774
		Station, financial statement.....	194
		notes.....	197, 498
		report of director.....	194
		University, notes.....	197, 498, 700
		Verruga fever, etiology and transmission....	262
		transmission by sand flies.....	856
		<i>Verticillium alboatrum</i> , notes.....	243, 444, 646

	Page.		Page.
<i>Verticillium puparum</i> , notes.....	562	Water—Continued.	
<i>Vespa crabro</i> , poison of.....	57	ascent and descent in trees.....	524
<i>Vesperus xatarti</i> , notes.....	858	bacteriology, treatise.....	814
Vetch, culture in the South, U.S.D.A.....	233	black alkaline and calcium sulphate, close	
fertilizing value, U.S.D.A.....	233	proximity, Ariz.....	415
hairy, culture in Porto Rico, P.R.....	631	bog, effect on Tradescantia root hairs.....	523
seed, adulteration and misbranding,		conservation in New South Wales.....	785
U.S.D.A.....	636	soils, P.R.....	85
germination energy of.....	538	containing hypochlorite of lime, effect on	
tests.....	740	vegetation, Can.....	242
varieties, Can.....	222	determination in cheese.....	311, 810
Veterinary—		foods.....	799
bacteriologist of Union of South Africa,		sugar and molasses.....	800
report.....	581	direct transfer of in ruminants.....	66
college of eastern New York.....	197	displacement of plant nutrients by.....	218
colleges, accredited, U.S.D.A.....	770	drinking, effect on digestion in horses.....	672
medicine, progress in.....	301, 498, 581	studies.....	267
treatise.....	476	duty of.....	180
sanitary board of Denmark, report.....	377	N. Mex.....	621
science, teaching in agricultural course.....	500	Nev.....	138
service in France.....	880	in irrigation, U.S.D.A.....	588
<i>Vigna catjang</i> , analyses.....	215	effect on denitrification in soils.....	817
<i>sincensis</i> , description.....	59	digestive efficiency of saliva.....	267
Village communities in European farming.....	789	strength of concrete.....	487
Vine curculio injurious to roses.....	657	yield in pot experiments.....	514
diseases in Wurttemberg.....	845	evaporation by corn.....	525
Vinegar, chemistry and biology of.....	116	tests, equipment for.....	814
methods of analysis.....	798	examination, treatise.....	506
Vineyards as affected by oxalic compounds.....	49	excess, detection in chopped meat.....	460
reconstitution.....	238, 356	filters, notes.....	815
(See also Grapes.)		flow of in artificial channels.....	181
Violet diseases, studies and bibliography.....	753	pipes.....	891
Violets, bibliography.....	543	glass as an egg preservative, Wash.....	875
Thielavia disease of.....	650	ground, relation to forests.....	240
treatise.....	149, 543	studies, U.S.D.A.....	137
Virginia coastal plain, economic products of.....	513	hard, use in tea making.....	566
College, notes.....	197	heat of absorption in wood.....	135
Station, financial statement.....	696	hemlock, toxicity, Nev.....	111
notes.....	900	hot, effect on germination of seeds, Vt.....	740
report of director.....	696	in animal organs.....	767
<i>Viscum cruciatum</i> , infection experiments.....	243	irrigation, concrete pipe for.....	485, 487
Vitamin fraction from yeast and rice polish-		cost per acre.....	486
ings.....	664	distribution.....	684
chemistry of.....	463	measurement, Mont.....	683
relation to beriberi.....	169	overflow basins for.....	485
Vocational education, legislation for state		use of sulphuric acid in,	
system.....	596	U.S.D.A.....	330
Volcanic ash, effect on soils, Alaska.....	726	methods of analysis.....	408, 412, 797
dust as a factor in climatic changes,		sampling, Cal.....	814
U.S.D.A.....	720	mineral, analyses, N. Dak.....	866
Volcanoes, relation to climate.....	720, 721	of Illinois, classification.....	617
Wages in Australia.....	393	movement in soils, N. Mex.....	620
United Kingdom.....	766	of Illinois, analyses.....	617
Walker County, Ga., soil survey, U.S.D.A....	16	New South Wales, analyses.....	785
Walls, retaining and storage, dimensions and		pollution, effect on fish.....	315
stresses.....	183	power at Great Falls, Potomac River....	616
Walnut caterpillar, egg parasites of.....	658	development in California.....	386
mealy bug, notes.....	454	Wisconsin,	
oil, detection.....	613	U.S.D.A.....	812
Wapiti, hybridization experiments.....	171	in Cascade Range.....	84
Warp deposits in England.....	514	northern Indiana.....	616
Washington College, notes.....	197, 399	purification.....	210, 315, 474
County, Pa., soil survey,		by chlorid of lime.....	512
U.S.D.A.....	16	for household use.....	815
Station, notes.....	99, 197, 399	rain. (See Rain.)	
Water—		requirements of infants.....	62
analyses, Can.....	210	plants, U.S.D.A.....	825
artesian, of Australia.....	16	resources of California.....	386

	Page.		Page.
Water—Continued.		Weeds, eradication.....	433, 637
resources of Hawaii.....	511	Hawaii.....	748
North Carolina coastal plain.....	722	Vt.....	736
Oregon.....	486	fertilizing value.....	320
south-central Washington.....	15	identification.....	637
Virginia coastal plain.....	511, 513	of arable lands.....	30
review of investigations.....	811	cultivated soils in Germany.....	337
Salton Sea, studies, Ariz.....	415	Indiana, treatise.....	144
sterilization by lime.....	814	relation to soils.....	523
ultraviolet rays.....	415	water requirements, U.S.D.A.....	826
subterranean, treatise.....	15	(See also specific plants.)	
supply as affected by forests.....	842	Weights and measures, inspection, Nev.....	266
for creameries.....	474	Weirs, steel, adjusting length of crest.....	684
farms.....	722	Wells, boring in New South Wales.....	785
U.S.D.A.....	696	convoluted tube, for irrigation.....	485
forecasting, U.S.D.A.....	812	relation to public health.....	512
of District of Columbia.....	616	shallow, concrete caisson curb for,	
farm homesteads, Can.....	210	Ariz.....	484
Hudson Bay and upper Missis-		of Indiana.....	16
sippi River.....	511	West Virginia Station, notes.....	600
New South Wales.....	785	University, notes.....	197, 600
North Pacific coast.....	511	Wethers, cost of fattening.....	572
Seward Peninsula, Alaska.....	210	Wheat—	
west Florida.....	315	analyses.....	271
western Gulf of Mexico.....	511	as affected by lithium, zinc, and lead	
underground, development.....	512	salts.....	520
surfaces, evaporation from, Nebr.....	225	ash analyses, Ohio.....	861
survey of Illinois.....	617	bacterial disease, notes.....	423
transpiration in leaves.....	217	bran, analyses.....	467
underground, of north-central Texas.....	209	Ky.....	270
vapor, retention by plants.....	524	N.H.....	769
well, relation to public health.....	512	N.J.....	666
Watermelons, reducing and nonreducing sug-		Wis.....	367
ars in.....	503	for steers.....	272
Waterways, papers on.....	291	phosphorus compounds in, Tex.....	804
Waterworks, design and construction.....	182	breeding.....	538
Wattle bagworm, notes.....	758	experimental error in, U.S.D.A.....	38
diseases, studies.....	45	experiments.....	143, 532
Waukesha County, Wis., soil survey, U.S.		N.C.....	31
D.A.....	17	U.S.D.A.....	38
Wax wastes, fertilizing value.....	129	for variation in nitrogen con-	
Waxes, chemical technology of.....	413	tent, Wash.....	835
Weather—		by-products, analyses, N.H.....	769
as affected by moon.....	314	ash analyses, Ohio.....	861
at Fresno, U.S.D.A.....	121	chaff, analyses.....	467
Point Reyes, U.S.D.A.....	812	composition, Minn.....	262
Bureau, report, U.S.D.A.....	209	as affected by environment.....	263
effect on growth and maturity of soy		factors affecting, Wash.....	833
beans, Tenn.....	616	continuous culture.....	227
forecasting, U.S.D.A.....	120	cooperative experiments.....	138
treatise.....	615	cost of production, N.Dak.....	690
maps, notes, U.S.D.A.....	414	cross-fertilization in.....	636
of Alberta.....	15, 85	culture experiments.....	427, 433, 538
Saskatchewan.....	85	Alaska.....	735
Upper San Joaquin watershed, U.S.		Ariz.....	426
D.A.....	812	Kans.....	836
proverbs, U.S.D.A.....	414	Mont.....	630
review of investigations.....	811	N.Dak.....	426
Weathering, effect on soil bacteria.....	221	Nebr.....	225
Webworm, garden, notes.....	252	U.S.D.A.....	429
Webworms, notes.....	252	in Nebraska.....	534
Weed cutters, tests.....	186	Texas Panhandle, U.S.D.A.....	429
killers, manual.....	341	on moor lands.....	835
seeds. (See Seeds, weed.)		diseases, notes.....	243, 845
Weeds, destruction by kainit.....	215	durum, notes, U.S.D.A.....	233
sulphate of ammonia.....	530	fertilizer experiments.....	126, 127, 227, 228, 632, 736
dissemination.....	637	Alaska.....	727
ensiling, Vt.....	741	Ohio.....	728

Wheat—Continued.	Page.
fertilizer experiments, U.S.D.A.	25
flag smut, treatment.	845
flour. (<i>See</i> Flour.)	
fly, notes.	357
foot disease, notes.	150
for summer silage.	473
frosted, notes, Can.	242
germinated, milling and baking tests.	863
germinated, milling and baking tests, N. Dak.	661
germinating, anaerobic respiration, N.Y.	
Cornell.	539
pentosan content.	525
germination—	
as affected by fertilizers.	327
fungicides.	346
temperature.	731
energy of.	538
tests.	740
Can.	223
germinative ability and vegetative force.	740
germs, analyses and feeding value.	467
grading, N.Dak.	661
grass, identification.	741
monograph.	141
green, analyses.	467
ground puffed, analyses, N.J.	666
growth as affected by meteorology.	510
temperature.	731
on volcanic ash, Alaska.	726
hay, analyses.	467
hybrid, spontaneous appearance.	636
improvement by selection.	532
Indian, handbook.	789
inheritance of winter resistance in.	635
irrigation, N. Mex.	621
experiments, N.Dak.	226
Nev.	138
U.S.D.A.	32
lands of western Australia, fertility.	315
leaf miner, studies, Ohio.	257
lime-magnesia requirements.	521
liming experiments, Can.	223
loose smut, treatment.	45, 548
middlings, analyses, N.H.	769
N.J.	666
midge, notes.	357
milling and baking tests.	263, 863
Minn.	262
N.Dak.	226, 661
quality as affected by—	
barley and rye, N.Dak.	866
germination.	863
North Dakota, screenings in, N.Dak.	866
peptic digestibility.	164
premature death of.	151
products, analyses, Vt.	769
pure bred, mutation in.	433
purslane sawflies affecting.	252
root aphids, notes.	252
rotation experiments.	227
rust, notes.	152, 445
resistance, inheritance.	532
seed, distribution in India.	538
tests and treatment.	446
seeding experiments, Can.	223, 224
N.Dak.	225, 425
Nebr.	225

Wheat—Continued.	Page.
seeding experiments, U.S.D.A.	429
seedlings, alkali tolerance of.	322
purification.	645
sensitiveness to fungicidal treatment.	151
shorts, analyses, N.H.	769
smut, treatment.	152
Can.	223
soil exchange experiments.	835
stem maggot, notes.	252
stinking smut, relation to time of seeding.	151
treatment.	750
straw, ash analyses, Ohio.	861
susceptibility to mildew and yellow rust.	844
tillering as a factor in.	538
variation in nitrogen content, U.S.D.A.	38
yield, U.S.D.A.	39
varieties.	228, 336, 433, 530
Can.	222
Mont.	630
N.C.	31
N.Dak.	225, 424
Nebr.	225, 736
Ohio.	31
U.S.D.A.	428
classification.	833
variety resistant to smut.	244
water requirements, U.S.D.A.	826
white grubs affecting.	252
wild, in Palestine, U.S.D.A.	37
yields, Nev.	138
Whey, ash analyses, Ohio.	861
lemonade, manufacture and analyses.	173
White fly, citrus, fungus diseases of, Fla.	251
remedies, U.S.D.A.	53
classification, U.S.D.A.	54
remedies, Fla.	262
woolly, studies, Fla.	251
grubs injurious to wheat.	252
notes, N.J.	653
U.S.D.A.	561
parasite of.	58
headed fungus, notes.	852
mussel scale, notes.	654
scale, notes.	654
Willow wood midge, remedies.	558
Wind, easterly, at Blue Hill Observatory,	
U.S.D.A.	721
effect on form of tree.	27
erosion, notes.	811
power, generation of electricity by.	184
Windmills for—	
electric lighting and power, N.Dak.	788
irrigation in India.	891
pumping, Ariz.	484
Windstorm at Seattle, Washington, U.S.D.A.	812
Wine, abnormal, treatment with milk or charcoal.	119
alcohol-free, preparation.	312
analyses.	119
composition as affected by clarification.	414
diminution of acidity in.	117
exports from South Australia.	837
lees, dried, fertilizing value.	129
making, notes.	414
school at Klosterneuburg.	414
micro-organisms in.	209
press residues, utilization.	117
production in Spain.	439

	Page.		Page.
Wine, white, sulphurous acid in.....	264	<i>Xenopsylla cheopsis</i> , distribution on rats....	755
Winters, classification.....	120	<i>Xyleborus dispar</i> , investigations.....	858
Wireworms injurious to corn.....	858	<i>immaturus</i> , notes, Hawaii.....	234
life history and structure.....	476	sp., notes.....	858
notes.....	252	P.R.....	53
N.J.....	653	spp., notes, Oreg.....	158
Wisconsin Station, notes.....	399,700	<i>Xylophuridea agrili</i> n. sp., description.....	563
University, notes.....	99,399,700	Yakima Indian Reservation drainage project.....	289
Wistaria, Chinese, crown gall of, Conn.State..	547	Yam mucin, notes.....	308
gall fly, notes.....	159	Yams, culture experiments, P.R.....	637
Women as affected by muscular work.....	568	fertilizer experiments, P.R.....	637
city and country, cooperation be-		varieties, P.R.....	637
tween.....	465	Yantias, culture experiments, P.R.....	637
place of in rural economy.....	898	fertilizer experiments, P.R.....	637
Wood, aging artificially.....	444	varieties, P.R.....	637
ashes, unbleached, fertilizing value....	632	Yearbooks of United States Department of	
use against mosses, Vt.....	741	Agriculture, index.....	599
boring beetle, notes, Hawaii.....	234	Yeast—	
creosoted, disappearance of phenols		acid-destroying, effect on lactic bacteria,	
from.....	111	Mich.....	8
fuel tests, U.S.D.A.....	544	assimilation of sodium thiosulphate by....	29,30
heat of absorption of water in.....	135	cells, assimilation of nutrients by.....	732
insulated, manufacture.....	444	determination of activity.....	864
mechanical failure, U.S.D.A.....	543	dry beer, analyses and feeding value....	467
pea silage, analyses, Can.....	270	effect on tartaric acid.....	504
pith-ray flecks in, U.S.D.A.....	44	factories, fermentation process in.....	509
preservation.....	444	isolation and testing of pure cultures....	119
preservatives, analyses, U.S.D.A.....	344	of fat from.....	459
preserving oils, antiseptic tests.....	111	mixed cultures v. pure cultures.....	714
stave pipe, use in irrigation.....	84	penetration of egg shells by.....	765
structure, bibliography.....	344	production of alcohol by.....	714
tick, control in Bitter Root Valley.....	658	relation to iodine compounds.....	133
using industries of Florida.....	644	organic soil constituents.....	817
New Hampshire.....	240	symbiosis by various types of.....	714
Ontario.....	843	vitamin-fraction from.....	664
waste, utilization.....	149	Yellow-fever mosquito, notes, U.S.D.A.....	656
(See also Lumber and Timber.)		Yerba santa mealy bug, notes.....	455
Woodpecker, Lewis, feeding habits.....	51	Yoghourt, bacteriology of.....	279,376,377
Woods, cedar, characteristics and use.....	842	preparation.....	376,377
of Alaska.....	342	studies and bibliography.....	59
Philippine, identification.....	747	Yokohama beans, yields, Fla.....	224
Woody aster, identification, Wyo.....	77	Yothers' Formula IV, tests, Fla.....	262
Wool, changes in weight during storage and		<i>Yponomeuta</i> spp., notes.....	252
transit, Ariz.....	467	<i>Zaleptopygus oberæ</i> n. g. and n. sp., descrip-	
contest, notes.....	69	tion.....	562
fat, absorption in the intestine.....	768	Zapupe fiber, strength of, U.S.D.A.....	313
industry in Australasia.....	872	Zebu-cattle, crossing experiments, P.R.....	666
Australia.....	570	Zebus, crossing with cattle.....	369
marketing, Ariz.....	467	digestion experiments.....	69
U.S.D.A.....	194	Zein, occurrence of lysin in.....	408
of primitive sheep.....	469	Zeitschrift für Angewandte Chemie, index....	501
preparation for market, Ohio.....	793	Zeolites as a source of potash.....	625
production in Spain.....	370	fertilizing value.....	211
wastes, fertilizing value.....	129	Zephyranthes-Cooperia hybrids, description..	341
Woolly aphid. (See Aphis, woolly.)		Zinc arsenite, insecticidal value, N.Y. State..	253
Working classes, standard of living.....	766	effect on <i>Aspergillus</i> spp.....	825
Worms in blood vessels of horses.....	783	oxid, effect on germination of seeds....	528
sheep, treatment.....	587	rôle in growth of fungi.....	28
Wyoming Station, notes.....	399,600	salts, effect on disease susceptibility in	
University, notes.....	399	cereals.....	844
<i>Xanthomelanodes peruanus</i> , notes.....	358	wheat.....	520
Xanthophyll formation, relation to mitochon-		<i>Zonocerus elegans</i> , notes.....	853
dria.....	827	Zoological index of genera and subgenera....	157
<i>Xenopsylla cheopsis</i> , bionomics of.....	756	<i>Zygosaccharomyces priorianus</i> , symbiosis by..	714

Issued February 7, 1914.

U. S. DEPARTMENT OF AGRICULTURE

OFFICE OF EXPERIMENT STATIONS

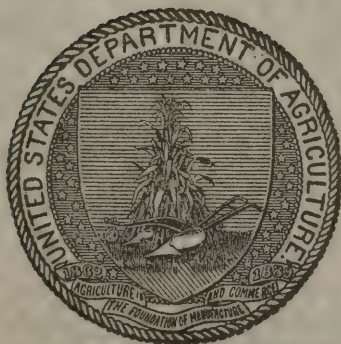
A. C. TRUE, DIRECTOR

Vol. XXIX

ABSTRACT NUMBER

No. 9

EXPERIMENT STATION RECORD



WASHINGTON
GOVERNMENT PRINTING OFFICE
1914

U. S. DEPARTMENT OF AGRICULTURE.

Scientific Bureaus.

WEATHER BUREAU—C. F. Marvin, *Chief*.
 BUREAU OF ANIMAL INDUSTRY—A. D. Melvin, *Chief*.
 BUREAU OF PLANT INDUSTRY—W. A. Taylor, *Chief*.
 FOREST SERVICE—H. S. Graves, *Forester*.
 BUREAU OF SOILS—Milton Whitney, *Chief*.
 BUREAU OF CHEMISTRY—O. L. Alsberg, *Chief*.
 BUREAU OF STATISTICS—L. M. Estabrook, *Statistician*.
 BUREAU OF ENTOMOLOGY—L. O. Howard, *Entomologist*.
 BUREAU OF BIOLOGICAL SURVEY—H. W. Henshaw, *Chief*.
 OFFICE OF PUBLIC ROADS—L. W. Page, *Director*.

OFFICE OF EXPERIMENT STATIONS—A. C. True, *Director*.

THE AGRICULTURAL EXPERIMENT STATIONS.

ALABAMA—

College Station: Auburn; J. F. Duggar.^a
 Canebrake Station: Uniontown; L. H. Moore.^a
 Tuskegee Station: Tuskegee Institute; G. W. Carver.^a

ALASKA—Sitka: C. C. Georgeson.^b

ARIZONA—Tucson: R. H. Forbes.^a

ARKANSAS—Fayetteville: M. Nelson.^a

CALIFORNIA—Berkeley: T. F. Hunt.^a

COLORADO—Fort Collins: C. P. Gillette.^a

CONNECTICUT—

State Station: New Haven; } E. H. Jenkins.^a
 Storrs Station: Storrs;

DELAWARE—Newark: H. Hayward.^a

FLORIDA—Gainesville: P. H. Rolfs.^a

GEORGIA—Experiment: R. J. H. De Loach.^a

GUAM—Island of Guam: J. B. Thompson.^b

HAWAII—

Federal Station: Honolulu; E. V. Wilcox.^b

Sugar Planters' Station: Honolulu; H. P. Agee.^a

IDAHO—Moscow: W. L. Carlyle.^a

ILLINOIS—Urbana: E. Davenport.^a

INDIANA—La Fayette: A. Goss.^a

IOWA—Ames: C. F. Curtiss.^a

KANSAS—Manhattan: W. M. Jardine.^a

KENTUCKY—Lexington: J. H. Kastle.^a

LOUISIANA—

State Station: Baton Rouge;
 Sugar Station: Audubon Park, } W. R. Dodson.^a
 New Orleans;
 North La. Station: Calhoun;

MAINE—Orono: C. D. Woods.^a

MARYLAND—College Park: H. J. Patterson.^a

MASSACHUSETTS—Amherst: W. P. Brooks.^a

MICHIGAN—East Lansing: R. S. Shaw.^a

MINNESOTA—University Farm, St. Paul: A. F. Woods.^a

MISSISSIPPI—Agricultural College: E. R. Lloyd.^a

MISSOURI—

College Station: Columbia; F. B. Mumford.^a

Fruit Station: Mountain Grove; Paul Evans.^a

^a Director.

^b Special agent in charge.

^c Acting director.

MONTANA—Bozeman: F. B. Linfield.^a

NEBRASKA—Lincoln: E. A. Burnett.^a

NEVADA—Reno: S. B. Doter.^a

NEW HAMPSHIRE—Durham: J. C. Kendall.^a

NEW JERSEY—New Brunswick: J. G. Lipman.^a

NEW MEXICO—State College: Fabian Garcia.^a

NEW YORK—

State Station: Geneva; W. H. Jordan.^a

Cornell Station: Ithaca; W. A. Stocking, Jr.^a

NORTH CAROLINA—

College Station: West Raleigh; } B. W. Kilgore.^a
 State Station: Raleigh;

NORTH DAKOTA—Agricultural College: T. P. Cooper.^a

OHIO—Wooster: C. E. Thorne.^a

OKLAHOMA—Stillwater: L. L. Lewis.^a

OREGON—Corvallis: J. Withycombe.^a

PENNSYLVANIA—

State College: R. L. Watts.^a

State College: Institute of Animal Nutrition,
 H. P. Armsby.^a

PORTO RICO—

Federal Station: Mayaguez; D. W. May.^b

Sugar Planters' Station: Rio Piedras; J. T. Crawley.^a

RHODE ISLAND—Kingston: B. L. Hartwell.^a

SOUTH CAROLINA—Clemson College: J. N. Harper.^a

SOUTH DAKOTA—Brookings: J. W. Wilson.^a

TENNESSEE—Knoxville: H. A. Morgan.^a

TEXAS—College Station: B. Youngblood.^a

UTAH—Logan: E. D. Ball.^a

VERMONT—Burlington: J. L. Hills.^a

VIRGINIA—

Blacksburg: S. W. Fletcher.^a

Norfolk: Truck Station, T. C. Johnson.^a

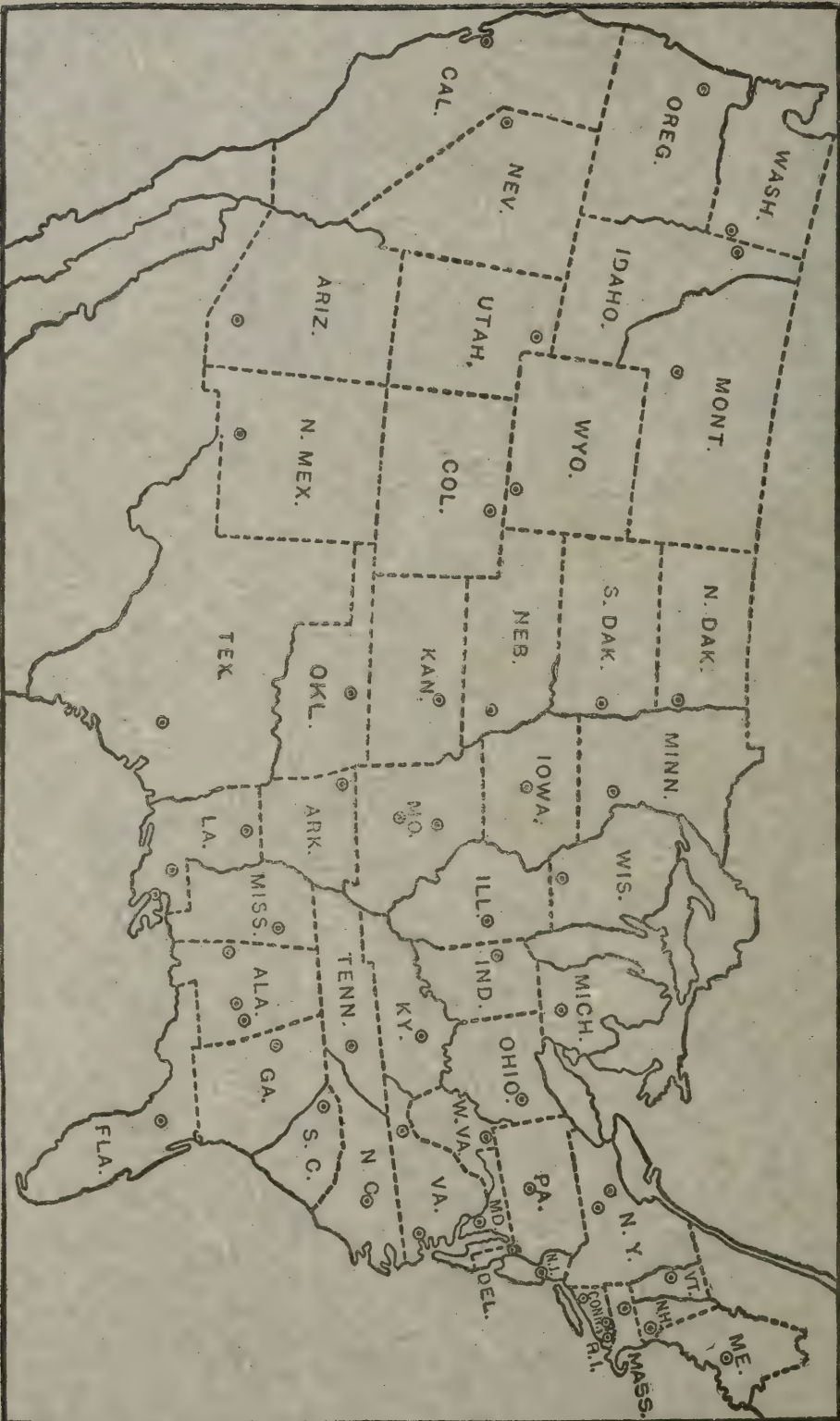
WASHINGTON—Pullman: I. D. Cardiff.^a

WEST VIRGINIA—Morgantown: E. D. Sanderson.^a

WISCONSIN—Madison: H. L. Russell.^a

WYOMING—Laramie: H. G. Knight.^a

THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES.



New York Botanical Garden Library



3 5185 00292 4007

